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Our Ref: PSM4010-003L Rev2

7 December 2020

Aliro Management Pty Ltd
Governor Macquarie Tower
Level 53, 1 Farrer Place
Sydney NSW 2000
cmacdonald@aliro.com.au

Attention: Colin MacDonald

Dear Colin

44 CLUNIES ROSS STREET, PROSPECT.
DESKTOP STUDY AND RESULTS OF GEOTECHNICAL INVESTIGATION

1. Introduction

This letter provides the results of desktop study, factual results of site investigation between 8 and 10 January 2020 and interim geotechnical design advice (IGDA) for the proposed industrial development and associated earthworks at Clunies Ross Street, Prospect NSW.

2. Background

PSM understands the following about the proposed development:

- The site currently comprises Boral industrial facilities at the southern side and Austral brick factories, warehouses and storage racks at the northern side
- An existing creek and stormwater basin are located at the northwest corner of the proposed development
- Seven (7) pads are proposed with up to 8 m of cut and 14 m of fill.

Figure 1 presents the site locality plan with the proposed pad boundaries (Pad 1 to 7).

PSM has previously issued the following letters at the site of Boral House, Pads 4 to 6:

- Preliminary Geotechnical Investigation (Ref: PSM3470-002L, dated 23 October 2017)
- Desktop Study and Interim Geotechnical Design Advice (Ref: PSM3470-300L Rev1, 7 June 2019).

We understand Douglas Partners (DP) has also undertaken a geotechnical investigation at Boral House in 2018 and issued a geotechnical report in 2019 (Ref: 86638.00.R.001.DftA, dated 5 February 2019).

3. Desktop Study

We understand three (3) previous geotechnical investigations have been undertaken at Pad 4, 5 and 6 from 2017 to 2019. As part of the desktop study, we have reviewed the following documents:

- The 1:100,000 Penrith Geological Map.
- NSW Orthomap (1983).
- Information from our previous PSM geotechnical investigations (Ref: PSM3470-002L, dated 23 October 2017 and PSM3470-300L Rev1, 7 June 2019).
- Proposed cut / fill plan
- DP's report "Geotechnical Investigation and Preliminary Salinity Assessment" (Ref: 86638.00.R.001.DftA, dated 5 February 2019).

3.1 Subsurface conditions

PSM has reviewed the results of geotechnical investigation from DP's report (Ref: 86638.00.R.001.DftA, dated 5 February 2019) and our previous PSM report (Ref: PSM3470-300L Rev1, 7 June 2019). Eighteen (18) boreholes were undertaken on the Boral House Site (Pads 4 to 6).

3.1.1 Filling and Near Surface Modifications to Natural Ground

The surficial soils are expected to have been significantly modified by previous construction activities.

The factual results from past investigations indicate the following:

- The general thickness of fill is less than 1 m with the exceptions of three boreholes (BH2, BH6 and BH8 undertaken by DP in 2018) which indicate up to 4.7 m of fill
- Based on the NSW Orthomap (1983) and its contour plan, it is inferred that there were several stockpiles in excess of 10 m in height and access ramps to the Boral House site built in 1980s. This may be the source of some of the fill observed on site.

3.1.2 Rock

The factual results of the previous investigation indicate the following:

- Typically, weathered Dolerite was encountered with exception of DP BH2 in the northwest corner of the Boral House site which encountered SHALE
- The depth of top of BEDROCK is typically in the range of 0.5 to 1 m below ground level (BGL), with exception of three boreholes;
  - BH2 – 5.1 m to SHALE
  - BH6 – 3.2 m to DOLERITE
  - BH8 – 3.4 m to DOLERITE.
- Based on point load index testing and field descriptions the typical rock strength is in the range of very low to low strength with point load index results less than 0.3 MPa.

3.2 Groundwater

Groundwater was not reported in historical investigations.

3.3 Laboratory Testing

3.3.1 California Bearing Ratio (CBR) Testing

CBR testing was conducted by DP in 2018. Two tests were completed on Silty CLAYs at 100% Maximum Dry Density with Standard Compactive effort. The results were 10 to 11%.

3.3.2 Soil Salinity and Aggressivity

During the DP investigation, twenty-four (24) samples were collected at depths ranging from 0.2 m to 3.0 m.

The aggressivity test results summarised in DP's report indicate the following:

- The pH ranges from 7.2 to 9.0, with an average of 8.3
- The electrical conductivity ($EC_{1:5}$) ranges from 20 µS/cm to 680 µS/cm
- Chlorides range from less than 10 mg/kg to 310 mg/kg
- Soluble sulphates range from less than 10 mg/kg to 1000 mg/kg
- Cation Exchange Capacity (CEC) ranges from 23 meq/100g to 60 meq/100g
- Exchange Sodium Percentage (ESP) ranges from 1.0% to 3.0% indicative of non-sodic soils (DLWC, 2002).

4. Geotechnical Investigation

4.1 Fieldwork

The fieldwork was undertaken from 8 to 10 January 2020 under the full-time supervision of a PSM geotechnical engineer, who undertook the following tasks:

- Directing the testing locations and drilling
- Preparing engineering logs of the material encountered
- Collection of disturbed soil samples for laboratory testing.

The test locations were recorded with a hand-held GPS unit with a horizontal accuracy of approximately +/- 5m. Figure 1 presents the test locations. The borehole collar levels were interpolated in the survey plan (Ref: 74710_Merged DTM dwg, dated 20 January 2020) provided by Aliro Group.

Prior to testing, on-site service location "scans" was undertaken by a service locator in the presence of a PSM geotechnical engineer to asses if the locations were free from buried utilities.

4.2 Boreholes

A total of eight (8) boreholes (2020/BH05 to 2020/BH12) were drilled using a track mounted drill rig. Augering through soil and weathered rock was undertaken using a V-bit to refusal and continued with a TC-bit in rock until refusal or target depth was achieved.

Bulk soil samples for laboratory testing were taken directly from the auger. At the completion of the fieldwork, the boreholes were backfilled with excavated spoil.

Appendix A presents the geotechnical engineering borehole logs.

Site photographs including photos of typical landmarks and observed material are included in Figure 2 to 5.

4.3 Laboratory Testing

Ten (10) samples were sent to a geotechnical and an environmental laboratory for the following testing as shown in Table 1.

The following sample preparation was undertaken prior to CBR testing:

- Compact to 98% standard MDD, at optimum moisture content (OMC)
- Four (4) day soaked sample; and
- 4.5 kg surcharge.

Table 2 presents a summary of the CBR test results. Note that there is a significant difference in CBR in comparison to the DP results.

Particle Size Distribution (PSD) testing results are provided in Appendix C with a summary in Figure 7. Atterberg Limit testing results are provided in Appendix D with a summary in Table 3 and Figure 8.

Soil aggressivity testing was completed on five (5) samples, Table 4. Laboratory test certificates are presented in Appendix E.

Table 1 – Summary Table of Laboratory Testing

Borehole ID	Location[4]	Sample Depth (m)	Material	Laboratory Testing			
				PSD[1]	Atterberg Limits	CBR[2]	Aggressivity[3]
2020/BH05	Pad 3	2.5	FILL				x
2020/BH06	Pad 2	1.0 – 1.5	SOIL	x	x	x	
		1.5	SOIL				x
2020/BH08	Pad 1	1.0 – 1.5	SOIL	x	x	x	
		1.6	SOIL				x
2020/BH09	Pad 7	2.0 – 3.0	SOIL	x	x	x	
		2.5	SOIL				x
2020/BH10	Pad 7	2.0 – 3.5	SOIL	x	x	x	
2020/BH11	Pad 1	3.0 – 4.0	SOIL	x	x	x	
2020/BH12	Stormwater basin	1.7	SOIL				x

Notes:

1 Particle-Size Distribution Testing
2 California Bearing Ratio Testing
3 Aggressivity Testing, including Salinity and Corrosivity
4 Refers to the site locality plan in Figure 1

Table 2 – CBR Test Results

Sample ID (depth)	Material Description	Soaked CBR (%)	OMC (%)	Standard Maximum Dry Density (t/m3)	Swell (%)
2020/BH06 (1.0 to 1.5 m)	CLAY (CH)	7	32.7	1.42	1.0
2020/BH08 (1.0 – 1.5 m)	CLAY (CH)	1.0	18.9	1.73	5.0
2020/BH09 (2.0 – 3.0 m)	CLAY (CH)	2.5	23.0	1.61	3.0
2020/BH10 (2.0 – 3.5 m)	CLAY (CH)	1.0	26.2	1.55	5.5
2020/BH11 (3.0 – 4.0 m)	CLAY (CH)	2.0	19.1	1.71	4.5

Table 3 – Atterberg Limits Results

Sample ID (depth)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
2020/BH06 (1.0 to 1.5 m)	68	26	42	18.5
2020/BH08 (1.0 – 1.5 m)	57	17	40	16.5
2020/BH09 (2.0 – 3.0 m)	52	15	37	17
2020/BH10 (2.0 – 3.5 m)	70	16	54	21
2020/BH11 (3.0 – 4.0 m)	52	13	39	15.5

Table 4 – Summary of Aggressivity Testing Results

Sample ID	Sample Depth (m)	pH	Moisture Content (%)	Electrical Conductivity [µS/cm]	Chloride (mg/kg)	Soluble Sulphate (mg/kg)
2020/BH05	2.5	10.5	5.8	479	110	590
2020/BH06	1.5	8.3	26.4	88	10	40
2020/BH08	1.6	6.2	18.3	472	610	430
2020/BH09	2.5	8.5	26.3	181	430	30
2020/BH12	1.7	8.8	7.6	105	<10	<10

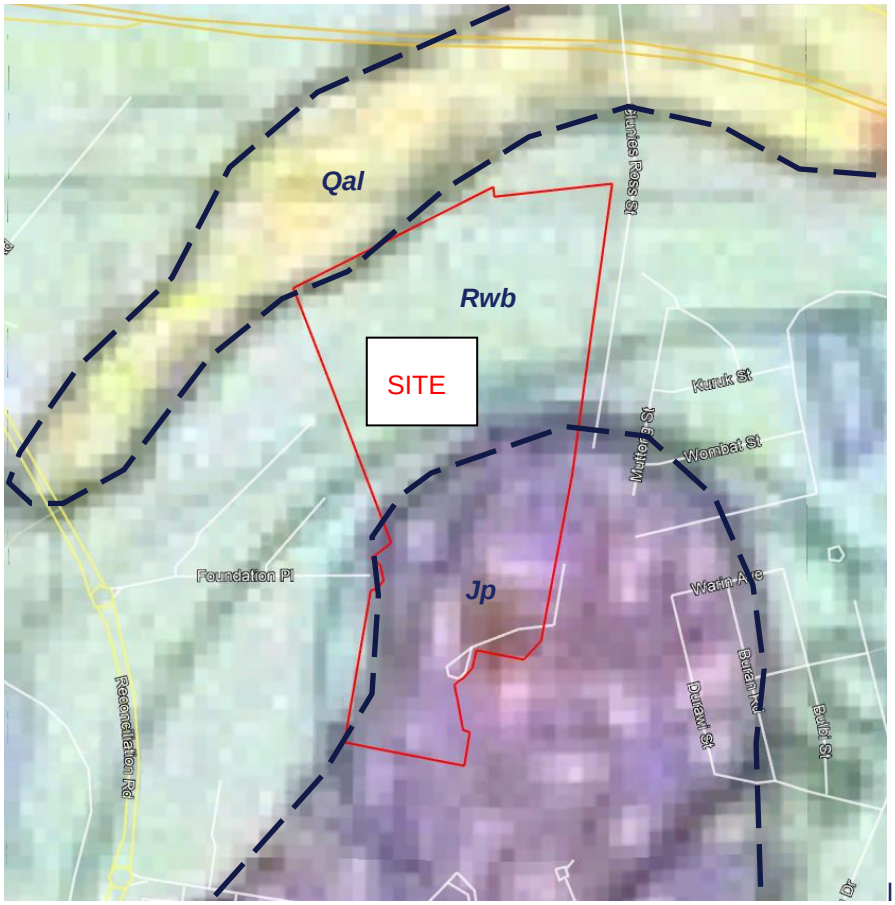
5. Site Conditions

5.1 Geological Setting

The 1:100,000 geological map for the Penrith region indicates the site is close to the boundary of the following rock units:

- Prospect Picrite (*Jp*) which typically comprises picrite, dolerite, minor basalt
- Bringelly shale of the Wianamatta group formation (*Rwb*) typically comprises shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal and tuff
- Qal which typically comprises fine-grained sand, silt and clay.

Inset 1 presents the geological map of the site. Note that given the Dolerite unit (*Jp*) is an intrusion, it is possible for sills and dykes of this material to be located beyond the boundaries depicted in Inset 1.



Inset 1

Inset 1: Geological Map

5.2 Surface Conditions

The site is bound by a Council reserve to the north, Clunies Ross Street to the east, and some industrial warehouses to the west and south. The site is significantly disrupted by historical cut fill and retaining walls however it generally slopes from the southeast boundary (at approximately RL 100 m AHD) towards the northwest boundary (at approximately RL 52 m AHD).

At the time of the fieldwork, the surface conditions mainly comprise the following:

- Girraween Creek runs sub-parallel to the northern property boundary, Photo 1
- The council reserve is typically grassed with gentle convergent slopes falling towards the creek, Photo 2
- An existing dam is located in the north west corner of the Austral site
- The Boral House site is characterised by significant retaining walls and cut fill, Photos 3 to 5
- The Austral site is characterised by a series of warehouses, offices, and asphalt and brick hardstand areas, Photos 6 to 8.

5.3 Subsurface Conditions

The subsurface conditions are summarised in Table 5. Table 6 presents the Reduced Levels (RL) in m AHD of the inferred geotechnical units encountered in the PSM boreholes during the 2019 and 2020 geotechnical site investigations.

We note that it is difficult to determine fill and natural in-situ material in augered boreholes where the fill is composed of locally excavated natural material. It is possible that some of the SOIL units are fill placed under controlled conditions and therefore the fill may be thicker than interpreted. Typical photos of residual shale and dolerite are presented in Figure 6.

No moderately weathered (or less weathered), high to very strength Dolerite was encountered within the boreholes. However, based on PSM's experience within the Greystanes Quarry, it can be anticipated that the strength of Dolerite will increase with depth. This has potential implications during construction if higher quality Dolerite is encountered during excavations.

Table 5 – Summary of Inferred Subsurface Conditions Encountered in Boreholes

Inferred unit	Inferred depth to top of unit below ground surface (m)	Description
TOPSOIL	0.0	Silty CLAY with/trace gravel; dark grey to dark brown, low to medium plasticity clay, angular to sub-angular gravel up to 10 mm, rootlets and vegetation observed, soft to firm consistency, dry to moist
PAVEMENT	0.0	BRICK wearing course, typically 100mm thick. Silty SAND with gravel; fine grained sand, dark brown to dark grey, sub-angular gravel up to 40 mm grey, loose density, dry.
FILL	0.0 to 0.2	Silty GRAVEL; medium grained, sub-angular to angular gravel up to 60 mm, pale grey to brown; silt low plasticity, loose to medium dense density, dry to moist. Silty CLAY with/trace gravel: low to medium plasticity, dark grey to brown; gravel sub-angular to angular up to 60mm, firm to stiff consistency, dry to moist. Gravelly SAND to silty SAND with gravel; fine to medium grained, pale brown to dark grey; gravel angular up to 60mm, loose consistency, dry.
RESIDUAL A	0.3 to 3.2	CLAY/Silty CLAY trace/with gravel: high plasticity, pale grey, dark brown, red brown; gravel sub-rounded to sub-angular up to 20mm, firm to very stiff consistency, dry to moist, sometimes wet. Inferred weathered Shale/Sandstone.
RESIDUAL B	0.2 to 3.0	SAND with gravel: fine grained, dark brown to orange brown; gravel fine to medium grained (up to 15mm), sub-angular, typically dry, medium dense to very dense. Inferred weathered Dolerite.
BEDROCK A	4.9 to 7.4	SHALE: pale/dark grey to brown, very low strength, highly weathered, iron staining.
BEDROCK B	1.7 to 6.2	DOLERITE: pale brown, very low to medium strength, highly weathered.
BEDROCK C	4.4 to 5.3	SANDSTONE: fine grained, pale yellow, very low strength, highly weathered.

Table 6 – Approximate Elevation of the Top of Inferred Geotechnical Units Encountered in Boreholes

BH ID	RLs of The Top of Inferred Unit (m AHD)							
	TOPSOIL / PAVEMENT	FILL	RESIDUAL A	RESIDUAL B	BEDROCK A	BEDROCK B	BEDROCK C	EOH[1]
2019/BH01	N/E	90.7	N/E	90.2	N/E	82.7	N/E	91.7
2019/BH02	77.3	77.1	N/E	76.15	N/E	74.5	N/E	68.3
2019/BH03	85.7	N/E	N/E	85.6	N/E	84.2	N/E	77.7
2019/BH04	N/E	90.8	N/E	90.75	N/E	89.8	N/E	80.3
2019/BH05	82.40	82.36	N/E	82.2	N/E	80.9	N/E	71.9
2020/BH05	N/E	72.7	69.5	N/E	N/E	67.0	N/E	64.7
2020/BH06	N/E	66.2	65.5	63.19	N/E	62.2	N/E	58.2
2020/BH07	66.0	65.8	64.4	N/E	N/E	60.7	61.4	60.2 (PR)[2]
2020/BH08	61.1	61.0	60.4	N/E	56.2	N/E	N/E	53.1
2020/BH09	56.9	56.8	55.4	N/E	49.5	N/E	N/E	48.9
2020/BH10	54.5	N/E	54.2	N/E	48.2	N/E	N/E	46.5
2020/BH11	N/E	56.8	55.8	N/E	N/E	N/E	50.6	48.8
2020/BH12	58.0	N/E	57.7	N/E	N/E	N/E	56.3	53.5

Note:

1. EOH - End of hole
2. PR – Practical refusal
3. N/E – Not encountered

5.4 Groundwater

Groundwater seepage was encountered at the following boreholes:

- 2020/BH09 at approximately 5.5 m below ground
- 2020/BH10 at approximately 4.0 m below ground.

No long term groundwater monitoring was undertaken in the January 2020 investigation. Additional groundwater investigation has been completed in October 2020 and the results of that investigation are provided in a separate letter (ref. PSM4010-010, 26 November 2020). The designer shall consider that groundwater may influence excavations for bulk earthworks, retaining walls and footing systems and that dewatering may be required.

6. Salinity and Aggressivity Assessment

6.1 Soil Chemistry

The salinity and aggressivity test results summarised in Table 4 indicate the following:

- The pH ranges from 6.2 to 10.5
- Concentrations of chlorides range from less than 10 mg/kg to 610 mg/kg
- Concentration of sulphates range from less than 10 mg/kg to 590 mg/kg

- The electrical conductivity (EC1:5) ranges from 88 µS/cm to 479 µS/cm.

6.2 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (EC_e) as per Richards (1954). The method of conversion from EC1:5 to EC_e = EC1:5 x M, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested has been assessed as "Sandy loams", "Medium clay" and "Heavy clay" with a corresponding M of 14, 7 and 6 respectively. The salinity classification for the soil samples that were tested is presented in Table 7.

It is assessed that the majority of soils on site are in the range of "non-saline" to "slightly-saline" with the exception of one soil sample classified as "moderately saline".

Table 4.8.2 of Australian Standard AS3600-2009 "Concrete Structures" provides an exposure classification for concrete structures in saline soils based on soil electrical conductivity (EC_e). We assess the exposure classification for this site is "A2".

Table 7 – Salinity Classification.

Sample ID & Depth	$EC_{1:5}$ (dS/m)	Soil Type	M	EC_e (dS/m)	Salinity Class
2020/BH05 2.5 m	0.48	Sandy loams	14	6.7	Moderately saline
2020/BH06 1.5 m	0.09	Medium clay	7	0.6	Non-saline
2020/BH08 1.6 m	0.47	Medium clay	7	3.3	Slightly saline
2020/BH09 2.5 m	0.18	Heavy clay	6	1.1	Non-saline
2020/BH12 1.7 m	0.11	Medium clay	7	0.7	Non-saline

6.3 Corrosivity

Table 4.8.1 of AS3600-2009 "Concrete Structures" provides criteria for exposure classification for concrete in sulphate soils based on sulphates in soil and groundwater, and pH of soil. On the basis of the sulphate and pH testing completed we assess the exposure classification for concrete in sulphate soils to be A1.

Similarly, Table 6.4.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for concrete piles in soil, and here the exposure classification for concrete piles in soil is Mild.

Table 6.5.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of pH and chloride testing and interpreted resistivity (derived from EC) we assess the exposure classification for steel piles in the soil to be moderately aggressive.

7. Discussion and Recommendation

7.1 Groundwater

Additional groundwater investigation has been completed in October 2020 and the results of that investigation are provided in a separate letter (ref. PSM4010-010, 26 November 2020). The designer shall consider that groundwater may influence excavations for bulk earthworks, retaining walls and footing systems and that dewatering may be required.

7.2 Excavation Conditions

It is understood that the site may require significant bulk earthworks with cut and fill in the order of 8 m and 14 m respectively. The depth of proposed underground services was unknown at the time of reporting.

Excavation may include FILL, TOPSOIL, RESIDUAL SOILS and highly weathered SANDSTONE/SHALE and DOLERITE. Excavation in these units should be achievable using conventional earth moving equipment.

No moderately weathered (or less weathered), high to very strength Dolerite was encountered within the boreholes. However, based on PSM's experience within the Greystanes Quarry;

1. It can be anticipated that the strength of Dolerite will increase with depth with UCS ranging significant from 90 to 200 MPa in moderate weathered (or less weathered) Dolerite.
2. High strength core stones are often observed in the weathered Dolerite.

This has potential implications during construction if higher quality Dolerite is encountered during excavations.

Prospective contractors should make their own assessment of excavatability based on the complete set of factual and interpretive reporting available and their site inspection and experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used. Heavy rock breaking equipment will generate vibrations that may impact on neighbouring infrastructures. Where controls on vibrations are required, the contractor should consider the use of smaller hammers, rock saws and grinders to undertake the excavation.

7.3 Bulk Earthworks Specification and Interim Geotechnical Design Advice

We have prepared a separate document for the following:

- An Interim Geotechnical Design Advice (IGDA) for the proposed warehouse facilities – Refer to PSM4010-004L Rev1 (Appendix F)
- A draft Bulk Earthworks Specification – Refer PSM4010-005S (DRAFT) (Appendix G).

Should there be any queries, do not hesitate to contact the undersigned.

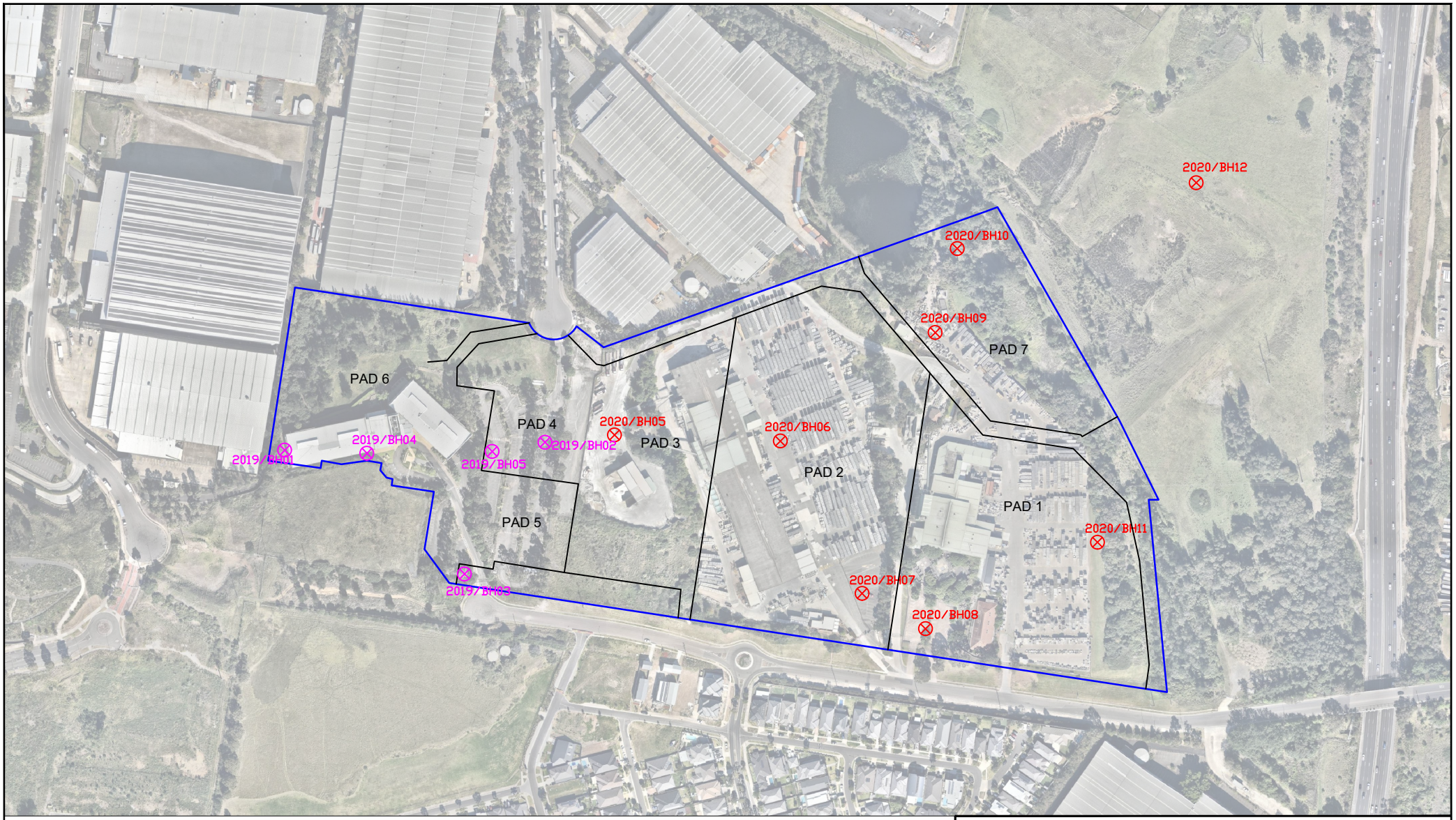
For and on behalf of
PELLS SULLIVAN MEYNINK

DANE POPE
ASSOCIATE GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
PRINCIPAL

Encl.

Figure 1	Site Locality Plan
Figure 2	Selected Site Photos (1 of 5)
Figure 3	Selected Site Photos (2 of 5)
Figure 4	Selected Site Photos (3 of 5)
Figure 5	Selected Site Photos (4 of 5)
Figure 6	Selected Site Photos (5 of 5)
Figure 7	Results of PSD Testing
Figure 8	Results of Atterberg Limit and Linear Shrinkage Testing
Appendix A	Engineering Borehole Logs
Appendix B	Results of CBR Testing
Appendix C	Results of PSD Testing
Appendix D	Results of Atterberg Limit and Linear Shrinkage Testing
Appendix E	Results of Soil Aggressivity Testing
Appendix F	Interim Geotechnical Design Advice – PSM4010-004L Rev1
Appendix G	Draft Bulk Earthworks Specification – PSM4010-005S (Draft)



Legend:

- 2020/BH - Boreholes undertaken in 2020
- 2019/BH - Boreholes undertaken in 2019
- Approximate boundary of proposed development
- Approximate pad boundaries

Notes:

1. Base map aerial photo retrieved from nearmap.com dated, 7/01/2020

Aliro Group
44 Clunies Ross Street
Prospect NSW

PROPOSED BOREHOLE LOCATIONS
LOCALITY PLAN

PSM4010-003L	Figure 1

Photo 1: Looking south east from borehole BH12

Photo 2: Looking south from borehole BH12

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44 Clunies Ross Street
Prospect, NSW
SELECT SITE PHOTOS
(1 of 5)

PSM4010-003L	FIGURE 2

Photo 3: Gabion Wall at Boral House looking south west

Photo 4: Looking North West across the Boral House car parks

Aliro Group
44 Clunies Ross Street
Prospect, NSW
SELECT SITE PHOTOS
(2 of 5)

PSM4010-003L	FIGURE 3

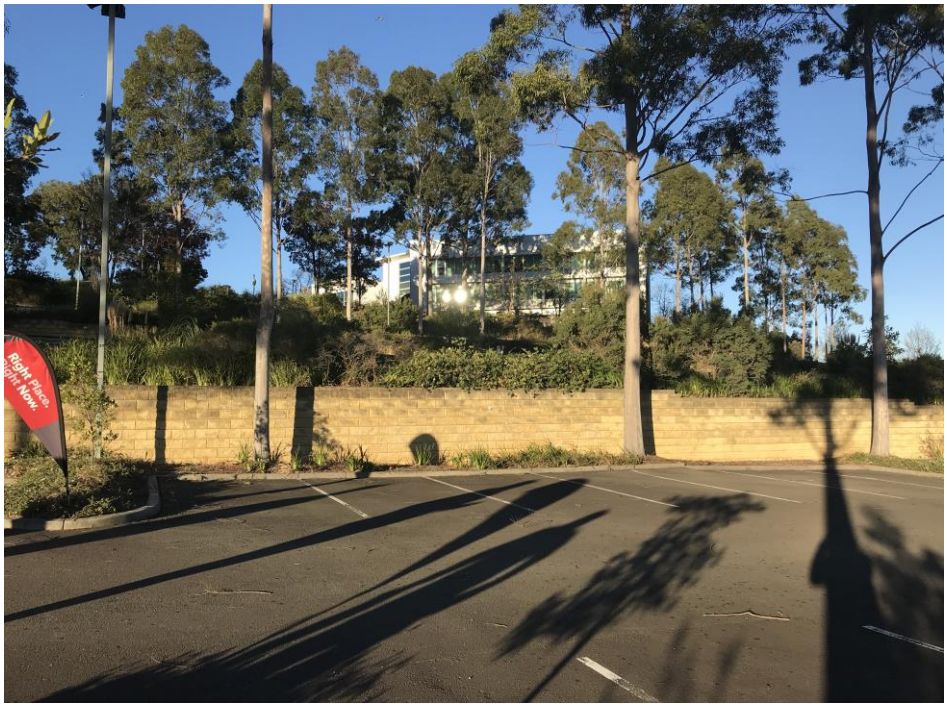

Photo 5: Looking south west towards Boral House

Photo 6: Austral site looking west from borehole BH08

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44 Clunies Ross Street
Prospect, NSW
SELECT SITE PHOTOS
(3 of 5)

PSM4010-003L	FIGURE 4

Photo 7: Borehole BH6 looking east

Photo 8: Borehole BH5 looking south west

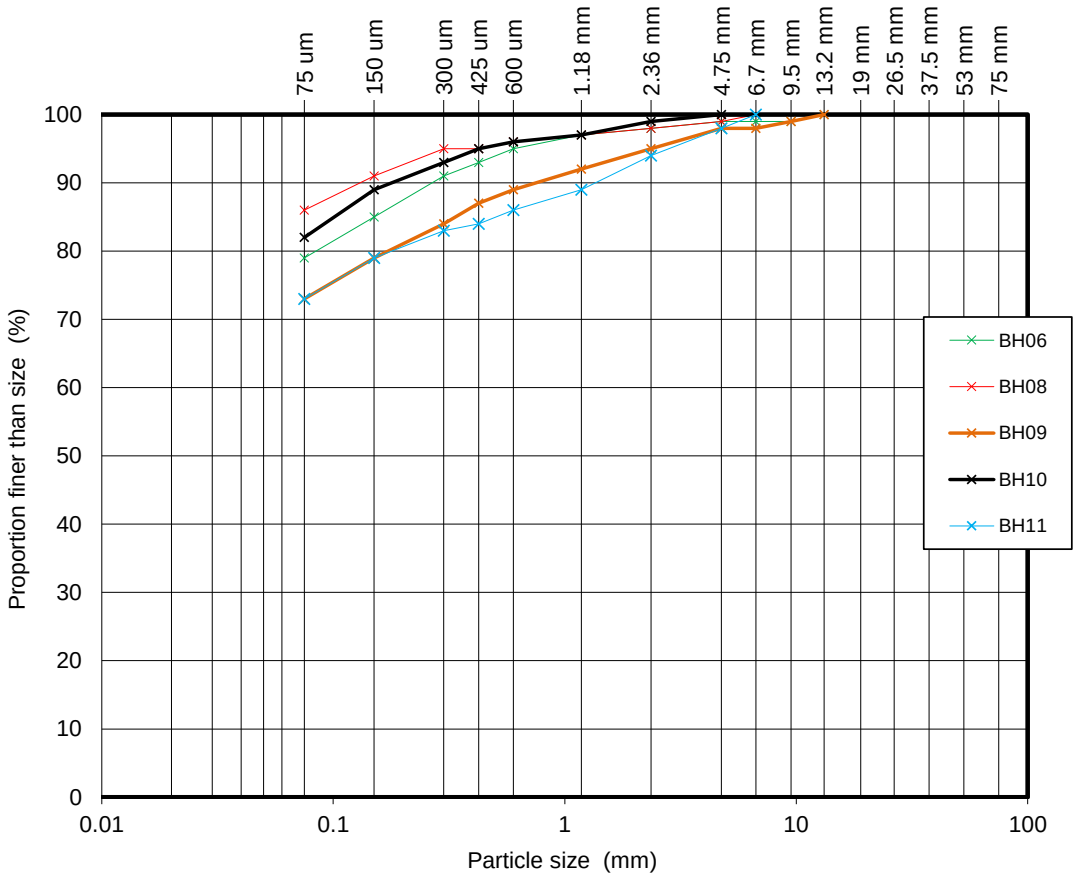
Aliro Group 44 Clunies Ross Street Prospect, NSW SELECT SITE PHOTOS (4 of 5)	
PSM4010-003L	FIGURE 5

Typical Residual Dolerite (Residual B)

Typical Residual Shale (Residual A)

Aliro Group
44 Clunies Ross Street
Prospect, NSW
SELECT SITE PHOTOS
(5 of 5)

PSM4010-003L	FIGURE 6



Particle Size Distribution of SOIL Samples

Notes:

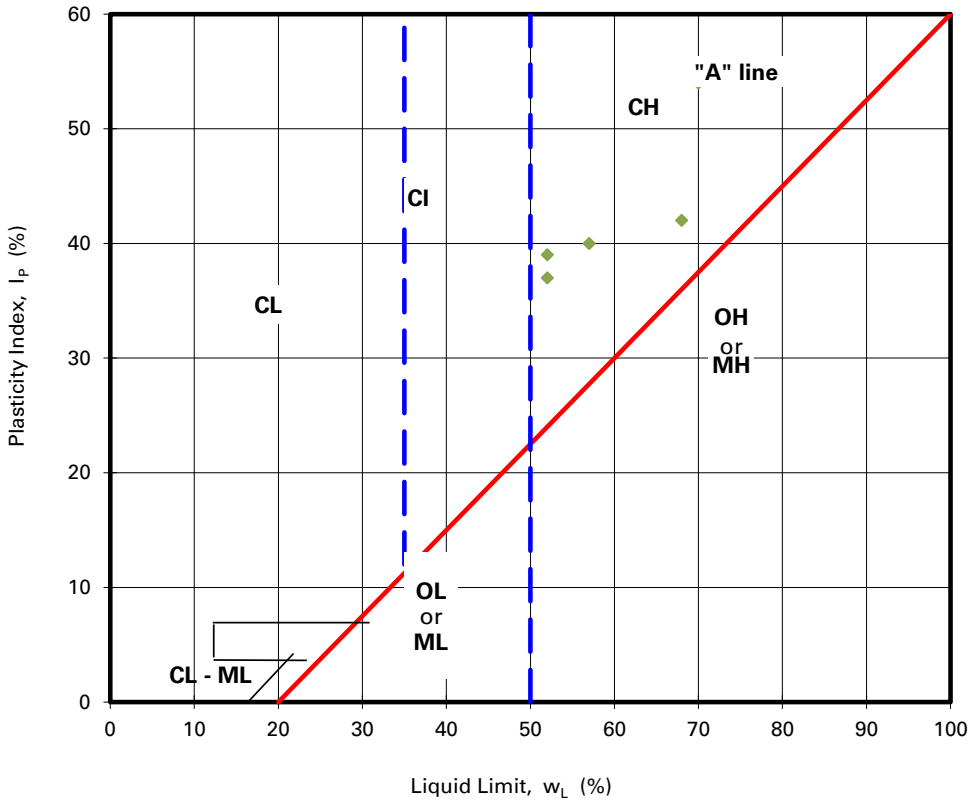
1 Based on the test reports provided by Soil test Services (Ref: PSM4010-003L Appendix C)

Aliro Management
44 Clunies Ross Street, Prospect

PARTICLE SIZE DISTRIBUTION GRAPHS

Pells Sullivan Meynink

PSM4010-003L	**FIGURE 7**



Notes:

1 Based on the test reports provided by Soil test Services (Ref: PSM4010-003L Appendix D)

Aliro Management
44 Clunies Ross Street, Prospect

ATTERBERG LIMIT GRAPHS

Pells Sullivan Meynink

PSM4010-003L	FIGURE 8

Appendix A
Engineering Borehole Logs

Borehole ID

2019/BH01

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW01	Logged By:	MB
Hole Position:	307968.0 m E 6256474.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	90.70 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	AG

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 16, 30, 31 N = 61		89.7	1		SP	SAND with clay trace gravel: fine grained, orange-brown; clay low plasticity; gravel sub-angular dolerite, up to 3 mm; bark and roots observed. Concrete boulder observed at 0.1 m, 300 mm, sub-angular. No clay from 0.2 m.	D	C	0.00: Inferred FILL. 0.50: Inferred RESIDUAL SOIL.
						88.7	2		SW	SAND trace gravel: fine grained, orange-brown; gravel fine grained, sub-angular.			1.00: SPT recovered length: 0.33 m. 2.00: SPT recovered length: 0.1 m.
				SPT 25+, Refusal		87.7	3					VD	
						86.7	4						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW01	Logged By:	MB
Hole Position:	307968.0 m E 6256474.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	90.70 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	AG

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			84.7	6		SW	SAND trace gravel: fine grained, orange-brown; gravel fine grained, sub-angular. *(continued)*	D			
										Becomes dark brown.		VD		
						83.7	7				M			
						82.7	8			DOLERITE: medium grained, dark brown, very low strength, highly weathered.				8.00: Inferred bedrock.
						81.7	9			Hole Terminated at 9.00 m Target depth - no refusal				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2019/BH02

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW02	Logged By:	MB
Hole Position:	307963.0 m E 6256691.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	77.30 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD

Operator: AG

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			76.3	0		OL	SILT with gravel: brown; gravel sub-angular, up to 3 mm; roots and sticks observed.		C		0.00: TOPSOIL.
									SW	Gravelly SAND: fine to medium grained, grey-brown; gravel sub-angular gravel up to 20 mm; dolerite fragments observed, extremely weathered and very low strength, up to 10 mm.				0.20: Inferred FILL.
				SPT 5, 10, 10 N = 20			1							1.00: SPT recovered length: 0.45 m.
						75.3			SW	SAND with gravel: fine grained, orange-brown; gravel sub-angular dolerite, up to 15mm.	D	MD		1.15: Inferred RESIDUAL SOIL.
				SPT 17, 22, 25 N = 47			2							2.50: SPT recovered length: 0.2 m.
						74.3	3			DOLERITE: dark brown and orange-brown, very low strength, highly weathered.				2.80: Inferred bedrock.
						73.3	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2019/BH02

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW02	Logged By:	MB
Hole Position:	307963.0 m E 6256691.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	77.30 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD

Operator: AG

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			71.3	6			DOLERITE: dark brown and orange-brown, very low strength, highly weathered. *(continued)*				
						70.3	7							
						69.3	8							
						68.3	9			Hole Terminated at 9.00 m Target depth - no refusal				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2019/BH03

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW03	Logged By:	MB
Hole Position:	308071.0 m E 6256624.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	85.70 m	
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator: AG

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 8, 10, 13 N = 23		84.7	1		OL SW	SILT with gravel: dark brown; gravel sub-angular, up to 10 mm; bark and roots observed.	M	C		0.00: TOPSOIL. 0.10: Inferred RESIDUAL SOIL.
										SAND with gravel: fine grained, orange-brown; gravel sub-angular dolerite, up to 15 mm.	D	MD		1.00: SPT recovered length: 0.33 m.
				SPT 22, Refusal		83.7	2			DOLERITE: orange-brown and dark brown, very low strength, highly weathered.				1.50: Inferred bedrock. 2.50: SPT recovered length: 0.2 m.
						82.7	3							
						81.7	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	30/05/2019
Project Name:	Boral House	Completed:	30/05/2019
Hole Location:	MW03	Logged By:	MB
Hole Position:	308071.0 m E 6256624.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	85.70 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: AG

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			79.7	6			DOLERITE: orange-brown and dark brown, very low strength, highly weathered. *(continued)*				
						78.7	7							
						77.7	8			Hole Terminated at 8.00 m Target depth - no refusal				
						76.7	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2019/BH04

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307972.0 m E 6256545.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	90.80 m	
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator: AG

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			90.8	0		GM SW	GRAVEL with silt: to 20 mm, sub-angular to angular, pale brown and grey. SAND with gravel: fine grained, dark brown; gravel sub-angular dolerite, up to 3 mm.	D	L VD	0.00: Inferred FILL. 0.05: Inferred RESIDUAL SOIL.
				SPT 21+ Refusal		89.8	1			DOLERITE: dark-brown, very low strength, highly weathered.			1.00: SPT recovered length: 0.1 m. Inferred bedrock.
						88.8	2						
						87.8	3						
						86.8	4						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307972.0 m E 6256545.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	90.80 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	AG

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			84.8	6			DOLERITE: dark-brown, very low strength, highly weathered. *(continued)*				
						83.8	7			Becomes brown and grey.				7.49: V-bit refusal.
										Continued on cored borehole sheet				
						82.8	8							
						81.8	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307972.0 m E 6256545.0 m N	Checked By:	AS

Drill Model and Mounting: Comacchio Geo 205 | Inclination: -90° | RL Surface: 90.80 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: AG

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					84.8	6						
					83.8	7		Continued from non-cored borehole sheet				
NMLC	Not Observed	90	Is(50) d=0.3 a=0.3 MPa		82.8	8		DOLERITE: orange and dark brown, massive.				JT, 20°, KL, UN, VR, <1 mm SM, 0°, CL & Gr, 5 mm JT, 3°, FE SN, CU, RF JT, 0°, FE SN, IR, RF
		99	Is(50) d=0.4 a=0.5 MPa					Joints typically inclined at 25°.				JT, 3°, FE SN, IR, RF JT, 25°, KL, UN, RF JT, 25°, KL, PR, RF JT, 25°, KL, PR, RF
			Is(50) d=0.1 a=0.5 MPa		81.8	9						JT, 25°, KL, PR, RF JT, 25°, KL, PR, RF
								Hole Terminated at 9.90 m Target depth - no refusal				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

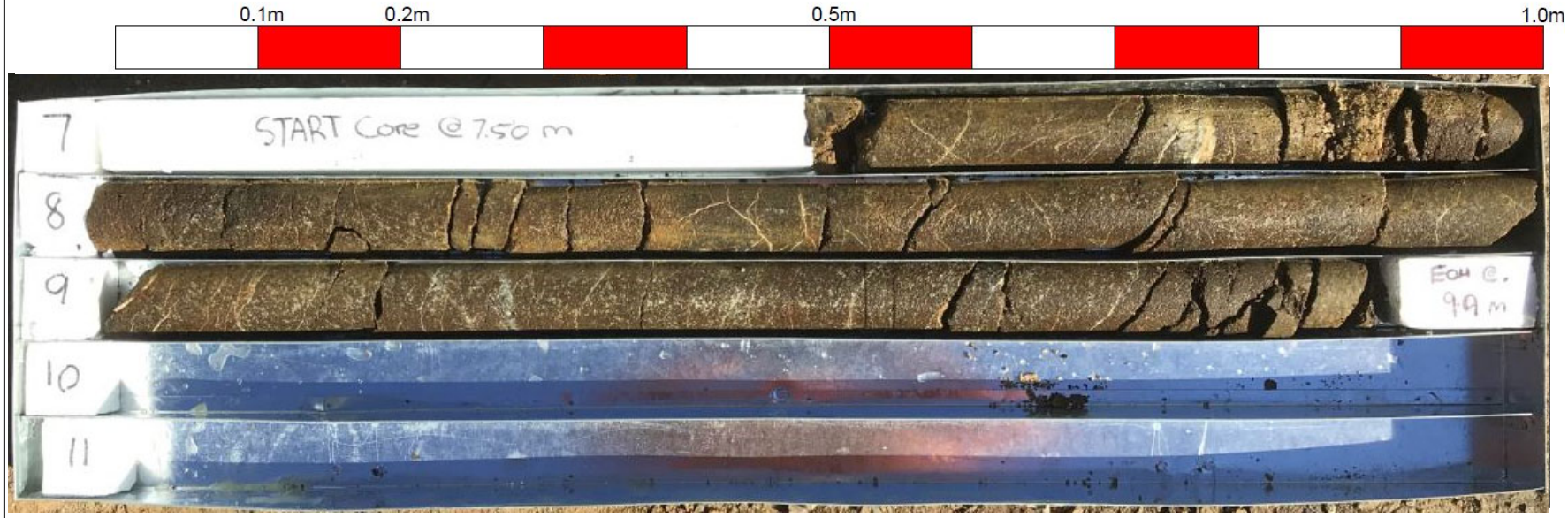
Logged in accordance with AS 1726:2017 Geotechnical site investigations

Job No. : PSM3470.30 BH ID:2019/BH04

PROJECT: Boral House

LOCATION: Clunies Ross St, Pemulwuy

FROM 7.50m TO: 9.90m DATE: 31/05/19



Pells Sullivan Meynink

Aliro Management Pty Ltd

Boral House

Clunies Ross Street, Pemulwuy NSW

CORE PHOTO 2019/BH04

(PHOTO 1 OF 1)

PSM3470-300L	Appendix A

Borehole ID

2019/BH05

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307966.0 m E 6256552.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	82.40 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD

Operator: AG

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 10, 13, 25+ Refusal		81.4 80.4 79.4 78.4	1 2 3 4		SW SW	Asphalt: 40 mm thick. Gravelly SAND: fine to medium grained, grey; gravel sub-angular to angular gravel, up to 20 mm. SAND with gravel: fine grained, orange-brown; gravel sub-angular dolertie, up to 3 mm. DOLERITE: dark brown and orange-brown, very low strength, highly weathered.	D D	C VD		0.04: Inferred FILL. Roadbase. 0.20: Inferred RESIDUAL SOIL. 1.00: SPT recovered length: 0.41 m. 1.50: Inferred bedrock.

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307966.0 m E 6256552.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	82.40 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: AG

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			76.4	6			DOLERITE: dark brown and orange-brown, very low strength, highly weathered. *(continued)*				
						75.4	7							
						74.4	8							
						73.4	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3470.30

Client:	Aliro Management Pty Ltd	Commenced:	31/05/2019
Project Name:	Boral House	Completed:	31/05/2019
Hole Location:		Logged By:	MB
Hole Position:	307966.0 m E 6256552.0 m N	Checked By:	AS

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	82.40 m
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: AG

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed							DOLERITE: dark brown and orange-brown, very low strength, highly weathered. *(continued)*				
						71.4	11			Hole Terminated at 10.50 m Target depth - no refusal				
						70.4	12							
						69.4	13							
						68.4	14							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH05

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 3	Logged By:	MT/JL
Hole Position:	307957.0 m E 6256748.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	72.74 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed						GM	Silty GRAVEL with gravel: medium grained, to 10 mm, sub-angular to angular, pale grey; gravel sub-angular to angular up to 10mm.		L		0.00: INFERRED FILL
				SPT 0.50 m 6, 8, 9 N=17					ML	Sandy SILT with gravel: low plasticity, dark grey; sand fine grained; gravel sub-angular to angular up to 20mm.	D	St		0.50: SPT recovery 450mm
						71.7	1		ML	Clayey SILT with gravel: low plasticity, dark grey; gravel sub-angular to angular up to 10mm.				
				SPT 1.50 m 4, 12, 12 N=24										1.50: SPT recovery 450mm SPT encountered crushed shale (fill) at 1.8m
						70.7	2			1.8m - Consists of sub-angular crushed shale fragments up to 10mm		VSt		
				SPT 3.00 m 3, 4, 8 N=12		69.7	3				D to M			3.00: SPT recovery 450mm
									CI	CLAY: medium plasticity, dark brown.				3.25: INFERRED RESIDUAL
				PP +180 kPa									×	
				SPT 4.00 m 5, 7, 11 N=18		68.7	4					St		4.00: SPT recovery 450mm

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH05

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 3	Logged By:	MT/JL
Hole Position:	307957.0 m E 6256748.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	72.74 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N							CH	CLAY: high plasticity, red & brown.	D to M	St		
AD/T		N	Not Observed	SPT 5.50 m 8, 15, 20 N=35		66.7	6			DOLERITE: pale brown, very low strength, highly weathered.				5.50: SPT recovery 450mm SPT encountered dolerite at 5.7m 5.70: INFERRED BEDROCK
						65.7	7							
						64.7	8			Hole Terminated at 8.00 m Target depth				
						63.7	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH06

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 2	Logged By:	MT/JL
Hole Position:	307962.0 m E 6256884.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	66.19 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 0.50-0.82 m 4,1,2 N=3		65.2	1		SW	Gravelly SAND: fine to medium grained, pale brown; gravel angular up to 30mm.	D	VL		0.00: INFERRED FILL
									SM	Silty SAND with gravel: fine to medium grained, dark grey; gravel sub-angular up to 60mm.				0.50: SPT recovery 320mm
									CH	Silty CLAY with sand: high plasticity, brown; sand fine to coarse grained.				0.70: INFERRED RESIDUAL
									CH	CLAY: high plasticity, dark brown.		F to St		
				SPT 1.50-1.95 m 2,3,4 N=7		64.2	2		CH	Silty CLAY: high plasticity, brown.	D to M	St to VSt		1.50: SPT recovery 450mm
				SPT 3.00-3.38 m 14,23,12 N=35		63.2	3					D		3.00: SPT recovery 380mm
AD/T		N				62.2	4			DOLERITE: pale brown, very low strength, highly weathered.				4.00: INFERRED BEDROCK
				SPT 4.50-4.68 m 6,10,Refusal										4.50: SPT recovery 180mm

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 2	Logged By:	MT/JL
Hole Position:	307962.0 m E 6256884.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	66.19 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed			60.2	6			DOLERITE: pale brown, very low strength, highly weathered. *(continued)*				
						59.2	7							
						58.2	8			Hole Terminated at 8.00 m Target depth				
						57.2	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH07

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 2	Logged By:	MT/JL
Hole Position:	308087.0 m E 6256951.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	65.98 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N							SM	Silty SAND with gravel: fine grained, dark brown & grey; gravel sub-angular up to 40mm.		L		0.00: 200mm ROAD BASE
									CI	CLAY with sand with gravel: medium plasticity, dark brown & black; sand fine grained; gravel sub-angular up to 30mm.				0.20: INFERRED FILL
				SPT 0.50-0.90 m 4,5,3 N=8							D to M	F		0.50: SPT recovery 400mm
						65.0	1							
				SPT 1.50-1.95 m 2,4,5 N=9										1.50: SPT recovery 450mm
AD/V		N	Not Observed						CI	CLAY: medium plasticity, black & brown.				1.60: INFERRED RESIDUAL 1.80: Rootlets observed
						64.0	2				M	St		
				SPT 3.00-3.45 m 2,4,5 N=9 PP +300 kPa		63.0	3		CH	CLAY: high plasticity, pale red & grey.			×	3.00: SPT recovery 450mm
											D to M	VSt		
						62.0	4							
AD/T		N		SPT 4.50-4.63 m 33,Refusal						SANDSTONE: fine grained, pale yellow, very low strength, highly weathered.				4.50: SPT recovery 130mm SPT encountered sandstone at 4.5m 4.60: INFERRED BEDROCK

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 2	Logged By:	MT/JL
Hole Position:	308087.0 m E 6256951.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	65.98 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed							SANDSTONE: fine grained, pale yellow, very low strength, highly weathered. *(continued)*				
										DOLERITE: pale brown, very low strength, highly weathered.				
						60.0	6			Hole Terminated at 5.80 m Refusal				
						59.0	7							
						58.0	8							
						57.0	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH08

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 1	Logged By:	MT/JL
Hole Position:	307116.0 m E 6257003.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	61.05 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N								PAVEMENT				0.00: 100mm BRICK PAVEMENT
									GM	Silty GRAVEL with sand: to 60 mm, angular, pale brown & grey; sand fine grained.		L		0.10: INFERRED FILL
									CL	Silty CLAY with gravel: low plasticity, brown & grey; gravel sub-angular up to 40mm.	D	F		
				SPT 0.50-0.92 m 4,3,3 N=6										0.50: SPT recovery 420mm
									CH	CLAY trace sand: high plasticity, red & grey; sand fine to medium grained; iron staining.				0.70: INFERRED RESIDUAL
						60.1	1							1.00: Rootlets observed
				SPT 1.50-1.93 m 3,4,8 N=12										1.50: SPT recovery 430mm SPT encountered ironstone at 1.8m
AD/V		N	Not Observed			59.1	2							
											D to M	St to VSt		
						58.1	3			2.9m - Becomes pale grey				
				SPT 3.00-3.45 m 8,10,11 N=21										3.00: SPT recovery 450mm SPT encountered ironstone at 3.3m
						57.1	4							
				SPT 4.50-4.95 m 5,10,24 N=34								H		4.50: SPT recovery 450mm SPT encountered shale at 4.9m
														4.90: INFERRED BEDROCK

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	08/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	08/01/2020
Hole Location:	Pad 1	Logged By:	MT/JL
Hole Position:	307116.0 m E 6257003.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	61.05 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed			55.1	6			SHALE: dark grey & black, very low strength, highly weathered. *(continued)*				
						54.1	7							
						53.1	8			Hole Terminated at 8.00 m Target depth				
						52.1	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH09

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 7	Logged By:	MT/JL
Hole Position:	307873.0 m E 6257011.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	56.87 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T										PAVEMENT				0.00: 100mm BRICK PAVEMENT
									SM	Silty SAND with gravel: fine grained, pale grey; gravel angular up to 20mm.	D	L		0.10: INFERRED FILL
									CI	CLAY with gravel: medium plasticity, dark brown & grey; gravel angular up to 60mm.		F		
				SPT 0.50-0.95 m 6,6,5 N=11						0.5m - Becomes high plasticity. Some ripped shale observed				0.50: SPT recovery 450mm SPT encountered crushed shale (fill) at 0.6m
				PP +170 kPa		55.9	1					St	×	
				SPT 1.50-1.80 m 2,2,6 N=8					CH	CLAY: high plasticity, yellow & brown.	D to M			1.50: INFERRED RESIDUAL SPT recovery 300mm
AD/V		N		PP +310 kPa		54.9	2						×	
				SPT 3.00-3.38 m 3,8,16 N=24		53.9	3		CL	CLAY trace gravel: low plasticity, yellow & brown; gravel sub-angular dolerite up to 10mm.		VSt		3.00: SPT recovery 380mm
											M to W		×	
				SPT 4.00-4.45 m 6,5,6 N=11 PP +120 kPa		52.9	4					St		4.00: SPT recovery 450mm

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 7	Logged By:	MT/JL
Hole Position:	307873.0 m E 6257011.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	56.87 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	▽	SPT 5.50-5.95 m 6,10,14 N=24 PP +430 kPa		50.9	6		CL	CLAY trace gravel: low plasticity, yellow & brown; gravel sub-angular dolerite up to 10mm. *(continued)*	M to W	St		5.50: SPT recovery 450mm
									CH	CLAY: high plasticity, pale grey.			×	
											W	VSt to H		
				SPT 7.00-7.37 m 18,30,Refusal		49.9	7							7.00: SPT recovery 370mm SPT encountered shale at 7.4m
AD/T		N								SHALE: dark grey, very low strength, highly weathered, iron staining.				7.40: INFERRED BEDROCK
						48.9	8			Hole Terminated at 8.00 m Target depth				
						47.9	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
▽ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH10

Page 1 of 2

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 7	Logged By:	MT/JL
Hole Position:	307804.0 m E 6257029.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	54.52 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N							CI	Silty CLAY with gravel: low to medium plasticity, dark brown; gravel sub-angular up to 10mm.		S		0.00: INFERRED TOPSOIL
									CH	Gravelly CLAY: high plasticity, dark brown; gravel rounded up to 6mm.				0.30: INFERRED ALLUVIUM
				SPT 0.50-0.80 m 5,4,4 N=8								F		0.50: SPT recovery 270mm
						53.5	1		CH	Silty CLAY trace gravel: high plasticity, dark brown; gravel rounded up to 6mm.				1.20: Rootlets observed
				SPT 1.50-1.90 m 3,5,7 N=12					CL	CLAY with sand: high plasticity, red & brown; sand fine to coarse grained.	D to M			1.50: INFERRED RESIDUAL SPT recovery 400mm
				PP +270 kPa		52.5	2						x	
				SPT 3.00-3.45 m 3,4,7 N=11		51.5	3					St		3.00: SPT recovery 450mm
											M to W			
			▽			50.5	4			4.0m - Becomes red & grey. Iron staining				
				SPT 4.50-4.95 m 5,5,7 N=11							W			4.50: SPT recovery 450mm SPT encountered ironstone at 4.5m

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
▽ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	09/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	09/01/2020
Hole Location:	Pad 7	Logged By:	MT/JL
Hole Position:	307804.0 m E 6257029.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	54.52 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density / Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N		SPT 6.00-6.42 m 11,19,Refusal		48.5	6		CL	CLAY with sand: high plasticity, red & brown; sand fine to coarse grained. *(continued)*	W	St VSt to H	6.00: SPT recovery 420mm SPT encountered shale at 6.3m
										SHALE: pale grey, very low strength, highly weathered.			6.30: INFERRED BEDROCK
						47.5	7						
						46.5	8			Hole Terminated at 8.00 m Target depth			
						45.5	9						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH11

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	10/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	10/01/2020
Hole Location:	Pad 1	Logged By:	MT/JL
Hole Position:	308045.0 m E 6257144.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	56.80 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 0.50-0.84 m 8,9,9 N=18					CL	Silty CLAY trace gravel: low plasticity, dark grey & brown; gravel sub-angular up to 10mm.	D	F		0.00: INFERRED FILL
									CL	Silty CLAY trace gravel: low to medium plasticity, dark grey; gravel sub-angular up to 6mm.		VSt		0.50: SPT recovery 340mm
AD/T		N		SPT 1.50-1.95 m 5,6,8 N=14		55.8	1		CI-CH	CLAY: medium to high plasticity, dark grey & brown.				1.00: INFERRED RESIDUAL 1.50: SPT recovery 400mm
AD/V		N		SPT 3.00-3.45 m 3,4,6 N=10 PP +180 kPa		54.8 53.8	2 3		CH	CLAY with gravel: high plasticity, dark brown; gravel sub-angular up to 20mm.	D to M	St	×	3.00: SPT recovery 450mm
										3.5m - Becomes pale brown and grey				
				PP +140 kPa		52.8	4						×	
				SPT 4.50-4.95 m 3,4,6 N=10										4.50: SPT recovery 450mm

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	10/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	10/01/2020
Hole Location:	Pad 1	Logged By:	MT/JL
Hole Position:	308045.0 m E 6257144.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	56.80 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 6.00-6.27 m 16,Refusal		50.8	6		CH	CLAY with gravel: high plasticity, dark brown; gravel sub-angular up to 20mm. *(continued)*	D to M	St		
												VSt to H		6.00: SPT recovery 270mm SPT encountered sandstone at 6.2m
AD/T		N				49.8	7			SANDSTONE: pale yellow, very low strength, highly weathered.				6.20: INFERRED BEDROCK
						48.8	8			Hole Terminated at 8.00 m Target depth				
						47.8	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

2020/BH12

Page 1 of 1

Engineering Log - Non Cored Borehole

Project No.: PSM4010

Client:	Aliro Management Pty Ltd	Commenced:	10/01/2020
Project Name:	44 Clunies Ross Street, Prospect	Completed:	10/01/2020
Hole Location:	Basin	Logged By:	MT/JL
Hole Position:	307750.0 m E 6257225.0 m N MGA94 Zone 56	Checked By:	DP

Drill Model and Mounting:	Geoprobe 78 22DT	Inclination:	-90°	RL Surface:	58.00 m		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	SPT 0.50-0.82 m 6,9,12 N=21		57.0	1		CL	Silty CLAY with gravel: low plasticity, pale grey; gravel angular up to 6mm.	D	F		0.00: INFERRED TOPSOIL
										CLAY: medium plasticity, pale brown.				0.30: INFERRED RESIDUAL
											D to M	St to VSt		0.50: SPT recovery 320mm
				SPT 1.50-1.92 m 10,13,Refusal								H		1.50: SPT recovery 420mm SPT encountered sandstone at 1.7m
AD/T		N				56.0	2			SANDSTONE: pale brown, very low strength, highly weathered.				1.70: INFERRED BEDROCK
						55.0	3							
						54.0	4			Hole Terminated at 4.50 m Target depth				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Appendix B
Results of CBR Testing

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report: 1
Report Date: 22/01/2020
Page 1 of 1

BOREHOLE NUMBER	BH 6	BH 8	BH 9	BH 10	BH 11
DEPTH (m)	1.00 - 1.50	1.00 - 1.50	2.00 - 3.00	2.00 - 3.50	3.00 - 4.00
Surcharge (kg)	4.5	4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	1.42 STD	1.73 STD	1.61 STD	1.55 STD	1.71 STD
Optimum Moisture Content (%)	32.7	18.9	23.0	26.2	19.1
Moulded Dry Density (t/m^3)	1.40	1.69	1.58	1.52	1.68
Sample Density Ratio (%)	98	98	98	98	98
Sample Moisture Ratio (%)	101	96	98	101	101
Moisture Contents					
Insitu (%)	32.5	22.5	27.3	33.2	23.7
Moulded (%)	32.9	18.2	22.5	26.4	19.3
After soaking and					
After Test, Top 30mm(%)	42.2	38.0	31.3	48.9	32.3
Remaining Depth (%)	35.5	24.2	25.3	30.6	20.5
Material Retained on 19mm Sieve (%)	0	0	0	0	0
Swell (%)	1.0	5.0	3.0	5.5	4.5
C.B.R. value: @2.5mm penetration	7	1.0	2.5	1.0	2.0

NOTES: Sampled and supplied by client. Samples tested as received.

- Refer to appropriate Borehole logs for soil descriptions
- Test Methods : RMS T117, T120 & T111.
- Date of receipt of sample: 10/01/2020.

NATA Accredited Laboratory Number:1327

Approved Signatory / Date (D. Treweek) 22/1/20

Appendix C
Results of PSD Testing

115 Wicks Road
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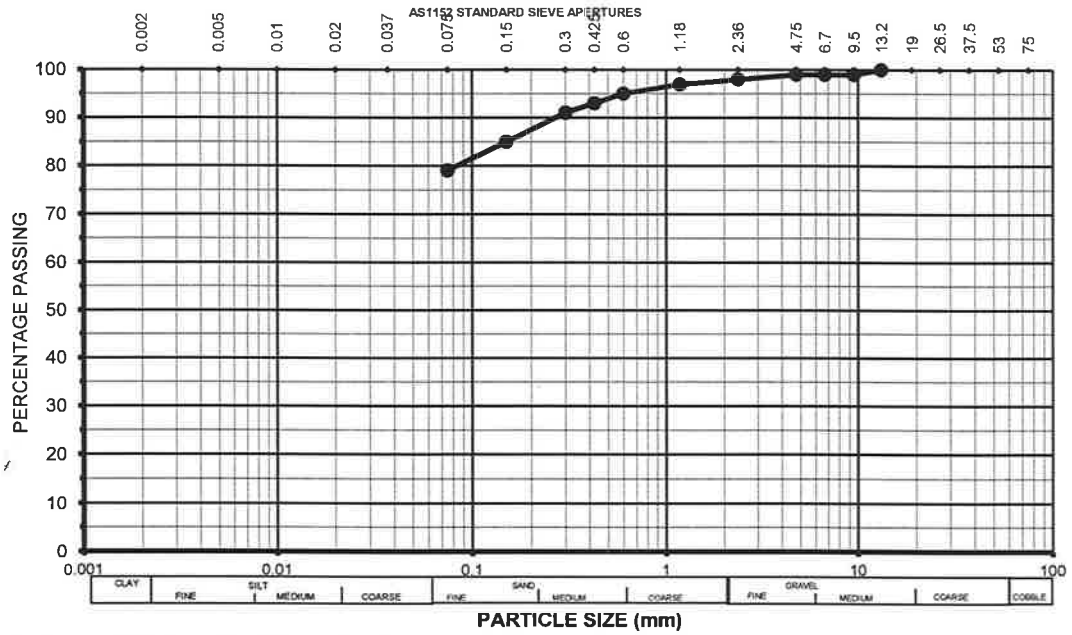
SOIL TEST SERVICES
ABN 43 002 145 173

PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report No: 2
Report Date: 21/01/2020
Page 1 of 5

Borehole Number: 6
Depth (m) : 1.0 - 1.5



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
13.2 mm	100
9.50 mm	99
6.70 mm	99
4.75 mm	99
2.36 mm	98
1.18 mm	97
600 µm	95
425 µm	93
300 µm	91
150 µm	85
75 µm	79

Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

• Notes: Sampled and supplied by client. Sample tested as received.

- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

NATA
NATA Accredited Laboratory Number:1327

Approved Signatory / Date
(D. Treweek) 21/1/20

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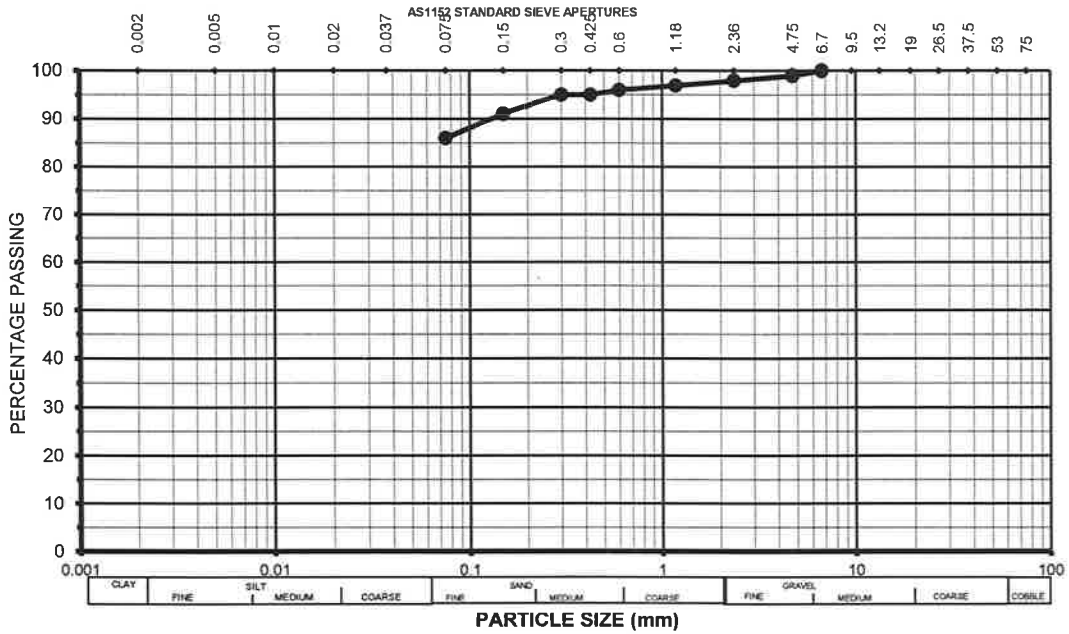
SOIL TEST SERVICES
ABN 43 002 145 173

PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report No: 2
Report Date: 21/01/2020
Page 2 of 5

Borehole Number: 8
Depth (m): 1.0 - 1.5



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
6.70 mm	100
4.75 mm	99
2.36 mm	98
1.18 mm	97
600 µm	96
425 µm	95
300 µm	95
150 µm	91
75 µm	86

Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

NATA Accredited Laboratory Number:1327

Approved Signatory / Date (D. Treweek) 21/1/20

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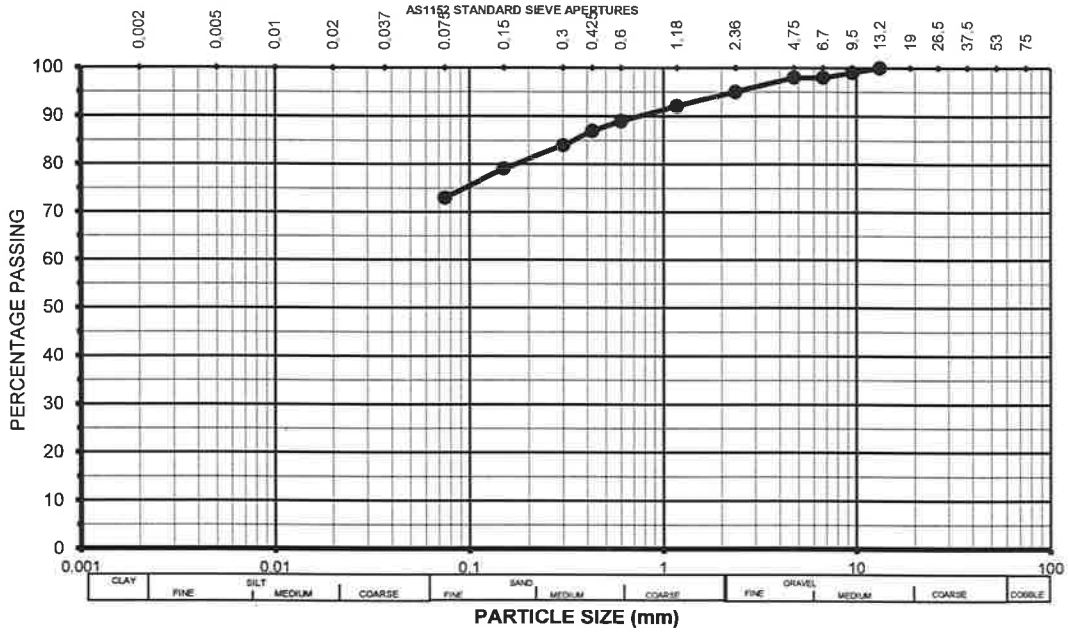
SOIL TEST SERVICES
ABN 43 002 145 173

PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report No: 2
Report Date: 21/01/2020
Page 3 of 5

Borehole Number: 9
Depth (m): 2.0 - 3.0



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
13.2 mm	100
9.50 mm	99
6.70 mm	98
4.75 mm	98
2.36 mm	95
1.18 mm	92
600 µm	89
425 µm	87
300 µm	84
150 µm	79
75 µm	73

Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

NATA Accredited Laboratory Number:1327

Approved Signatory / Date
(D. Treweek) 21/1/20

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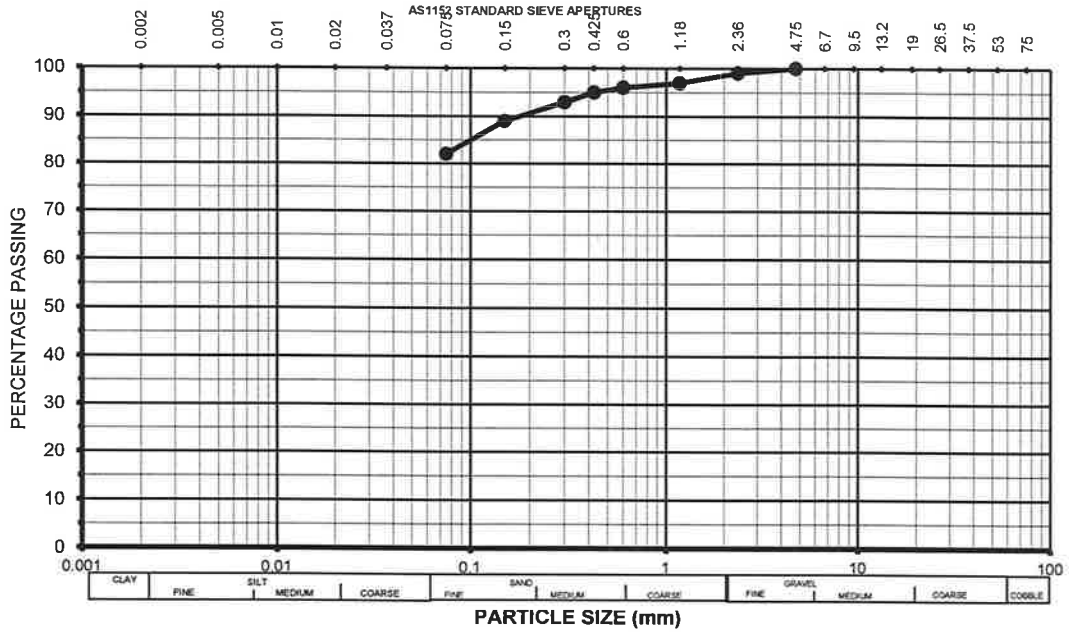
SOIL TEST SERVICES
ABN 43 002 145 173

PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report No: 2
Report Date: 21/01/2020
Page 4 of 5

Borehole Number: 10
Depth (m): 2.0 - 3.5



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
4.75 mm	100
2.36 mm	99
1.18 mm	97
600 µm	96
425 µm	95
300 µm	93
150 µm	89
75 µm	82

Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

NATA Accredited Laboratory Number:1327

Approved Signatory / Date
(D. Treweek)

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
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Email: dtreweek@jkgroup.net.au

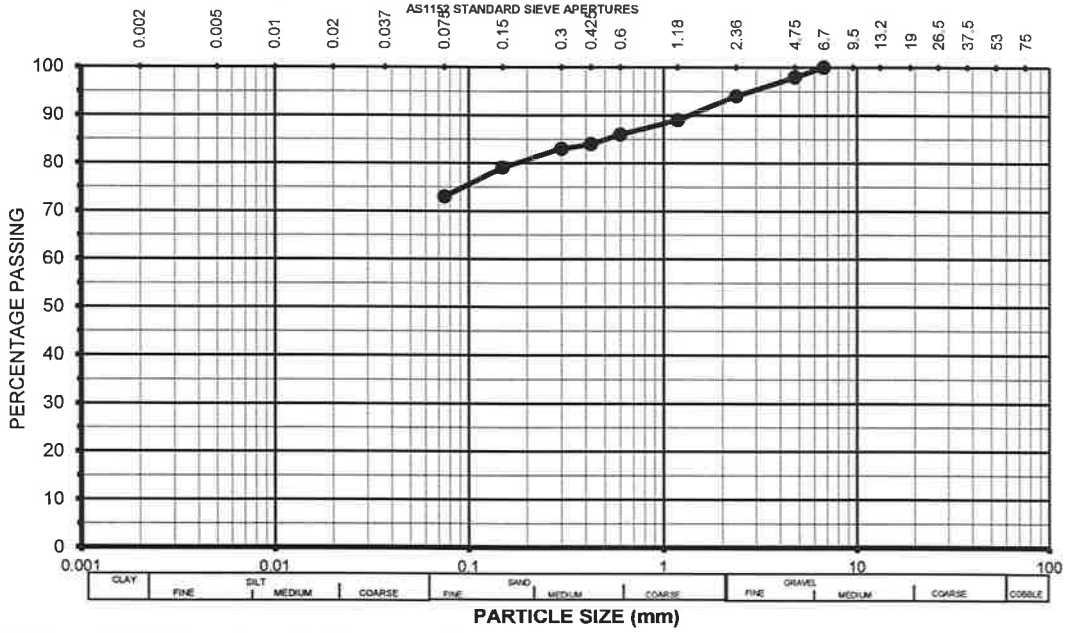
SOIL TEST SERVICES
ABN 43 002 145 173

PARTICLE SIZE DISTRIBUTION TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report No: 2
Report Date: 21/01/2020
Page 5 of 5

Borehole Number: 11
Depth (m): 3.0 - 4.0



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
6.70 mm	100
4.75 mm	98
2.36 mm	94
1.18 mm	89
600 µm	86
425 µm	84
300 µm	83
150 µm	79
75 µm	73

Test Method: AS1289.3.6.1 & 3.6.3 Dry Sieve (washed)

- **Notes:** Sampled and supplied by client. Sample tested as received.
- Please refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.

NATA Accredited Laboratory Number:1327

Approved Signatory / Date
(D. Treweek) 21/1/20

Appendix D
Results of Atterberg Limited and Linear Shrinkage Testing

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

ATTERBERG LIMIT AND LINEAR SHRINKAGE TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4010

Ref No: L4389E
Report: 3
Report Date: 28/01/2020

AS 1289	TEST METHOD	3.1.2	3.2.1	3.3.1	3.4.1
BOREHOLE NUMBER	DEPTH m	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %
6	1.0 - 1.5	68	26	42	18.5
8	1.0 - 1.5	57	17	40	16.5
9	2.0 - 3.0	52	15	37	17.0
10	2.0 - 3.5	70	16	54	21.0
11	3.0 - 4.0	52	13	39	15.5

Notes:

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 10/01/2020.
- Sampled and supplied by client. Samples tested as received.

NATA

NATA Accredited Laboratory Number:1327

28/01/2020

Authorised Signature / Date
(D. Treweek)

Appendix E
Results of Soil Aggressivity Testing

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2000826**	Page	: 1 of 2
Client	: **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Juno Liang	Contact	: Customer Services ES
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: PSM 4010	Date Samples Received	: 13-Jan-2020 14:20
Order number	: ----	Date Analysis Commenced	: 14-Jan-2020
C-O-C number	: ----	Issue Date	: 17-Jan-2020 09:56
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH5-2.5m	BH6-1.5m	BH8-1.6m	BH9-2.5m	BH12-1.7m
			Client sampling date / time	09-Jan-2020 09:00	08-Jan-2020 00:00	08-Jan-2020 11:00	09-Jan-2020 11:00	10-Jan-2020 11:00
Compound	CAS Number	LOR	Unit	ES2000826-001	ES2000826-002	ES2000826-003	ES2000826-004	ES2000826-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**10.5**	**8.3**	**6.2**	**8.5**	**8.8**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**479**	**88**	**472**	**181**	**105**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**5.8**	**26.4**	**18.3**	**26.3**	**7.6**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**590**	**40**	**430**	**30**	<10
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**110**	**10**	**610**	**430**	<10

Appendix F
Interim Geotechnical Design Advice – PSM4010-004L Rev1

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North Ryde NSW 2113
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E mailbox@psm.com.au
www.psm.com.au

Our Ref: PSM4010-004L REV1

26 November 2020

Aliro Group
Level 53, Governor Macquarie Tower
1 Farrer Place
Sydney NSW 2000
dlousick@aliro.com.au

Attention: David Lousick

Dear David

RE: 44 CLUNIES ROSS STREET, PROSPECT.
INTERIM GEOTECHNICAL DESIGN ADVICE

1. Introduction

This letter provides interim geotechnical design advice for the proposed warehouse development located at 44 Clunies Ross Street, Prospect NSW. PSM understand the proposed new facility will comprise typically light warehouse facilities.

This interim advice should be reviewed when the details of the warehouse design are known (design loads, floor levels, footing dimensions, etc) and will be confirmed or issued as final once the bulk earthworks are completed and audited.

Figure 1 presents the proposed development layout.

The interim geotechnical design advice in this letter has been provided on the following basis:

- The subsurface conditions encountered are as logged and inferred from the site investigations
- The proposed earthworks are completed in accordance with the Bulk Earthworks Specification (Ref: PSM4010-005S (DRAFT)).

If any of the above is not applicable, PSM should be requested to confirm that the design advice below is still valid.

2. Bulk Excavation

PSM understands that cut and fill works will be required for this site.

The design intent is for the bulk earthworks on site to be completed in accordance with a PSM Specification – PSM4010-005S (DRAFT). The Specification sets out clearly the roles and responsibilities of the earthworks contractor and its Geotechnical Inspection and Testing Authority (GITA). The Specification will only be varied with the consent of PSM to ensure that this interim design advice is able to be confirmed at the completion of the earthworks.

The Specification allows for a broad range of fill to be incorporated into the earthworks. The Specification requires close inspection, and frequent testing to provide a high level of confidence that the completed work complies with the Specification.

We have based our assessment of moduli on numerous plate load tests (PLTs) completed on VENM/ENM fills by PSM. Fill placed in accordance with such a Specification is referred to herein as ENGINEERED FILL. It is our opinion that the majority of the cut material would be suitable for reuse on the site as ENGINEERED FILL without the requirement for crushing. The criteria for and selection of acceptable material is set out in Clause 2.3 of the Specification.

If the structural or civil engineer requires engineering properties different to those provided in Section 3, then the Specification can be modified such that these properties will be obtained in the final earthworks. This allows the additional cost of the earthworks to be balanced against any economies achieved in other parts of the works.

3. Design Advice

3.1 Characteristic Surface Movement

While the proposed development is out of scope of AS2870-2011 “Residential slabs and footings”, we assess that, for fill placed in accordance with the Specification, the characteristic surface movement, y_s, would be in the range 40 mm to 60 mm and thus would classify the site as Class H1. The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their designs.

We recommend that all structures and services be detailed such that they preclude any local wetting up or drying out of the subgrade after initial equilibrium is reached following construction of the slab and that the subgrade be within specification at the time of construction of the slab. We note that normal mounding or sagging away from the perimeter of covered areas will still occur and perimeters, or open joints, will still respond to environmental changes.

Mounds at perimeters or penetrations of slabs open to the environment can be taken to be as per AS2870-2011 for y_s = 50 mm.

For effectively sealed areas away from the perimeter, the design should allow for the following:

- Differential mound movement, y_m = 15 mm. We note that this is not the total heave or settlement but the estimated local heave or settlement due to fill variability
- Tilts of up to approximately 1 in 300.

We note that desiccation and/or wetting up of the pad surface is possible should it be exposed to the elements for an extended period of time, particularly at completion of the bulk earthworks prior to the builder taking responsibility for the pad. To reduce the likelihood of this and preserve the pad condition we recommend the following should be considered following completion of the bulk earthworks:

- Placement of a sacrificial layer comprising road base or other equivalent material
- Grade the pad surface to reduce the extent and severity of standing water during and after weather events
- Minimise the time between the completion of earthworks and the builder commencing construction of the warehouse roof
- Limit vehicular and plant access until a roof has been installed.

Alternately, the builder may have to undertake some surficial remediation if the pad is to comply with the requirements of this IGDA (i.e. comply with the PSM Specification) at the time of construction. There should be a strict transfer of the risk. We recommend that building tenderers be required to indicate how they intend to manage this risk.

3.2 Foundations

3.2.1 Pad Footings

Pad footings can be proportioned based on an allowable bearing pressure (ABP) for centric vertical loads provided in Table 1. Higher ABPs in soil units may be available, but these depend on the size, depth, loads, etc., and would be subject to specific advice. The ABP needs to be confirmed by a geotechnical engineer during an inspection.

Settlements in soil units can be estimated using the elastic parameters provided in Table 1. We note that allowable bearing pressures presented in Table 1 assume a settlement of approximately 1% (or less) of the least footing dimension for footings in the rock.

3.2.2 Slab on ground

In general, we advise the slab on ground design can be based on a subgrade with a long-term Young's modulus of 10 MPa. The short-term Young's modulus can be taken to be 15 MPa. We note that the environmental effects (e.g. drying or wetting up of the finished surface) affecting the land prior to the development should be considered by the various designers of any development.

We note that the final bulk earthworks subgrade will require proof rolling and plate load testing to confirm the properties provided and may require some boxing out and refilling, etc.

We understand that the structural engineer should be able to design efficient slabs. If assessed deformation and settlement is an issue, our advice can be further refined if required.

The structural designer or builder may wish to employ a surface layer of road base / crushed sandstone / concrete for trafficability or structural purposes. This is not required to achieve the properties in this design advice.

Table 1 – Engineering parameters of inferred geotechnical units

Inferred unit	Bulk unit weight (kN/m^3)	Soil effective strength parameters		Allowable bearing pressure under vertical centric loading (kPa)	Ultimate bearing pressure under vertical centric loading (kPa)	Ultimate Shaft Adhesion (kPa)	Elastic parameters	
		c' (kPa)	ϕ' (deg)				Young's Modulus (MPa)	Poisson's Ratio
SOIL (e.g. engineered fill and natural soil)	18	0	30	150[1]	400[1]	N/A	10	0.3
BEDROCK A	22	N/A	N/A	700	3,000	50	50	0.3
BEDROCK B/C	22	N/A	N/A	1,200	3,600	150	100	0.35

Note: 1. Pad footings in soil unit should have a minimum horizontal dimension of 1.0 m and a minimum embedment depth of 0.5 m

3.2.3 Piled Foundations

Piles should be designed in accordance with the requirements in AS 2159 (2009), *Piling – Design and Installation.*

The parameters provided in Table 1 may be adopted in the design of piles founded in the bedrock unit.

The foundation designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer during a pile inspection
- Under permanent load, the contribution of side adhesion for soils including soil units should be ignored.

Pile settlement needs to be checked using the recommended elastic parameters in Table 1.

The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically centrically loaded. Should higher bearing capacities be required in Table 1, further advice should be sought from PSM.

With regards to the pile design we recommend that:

- A geotechnical strength reduction factor, Φ_g = 0.60 (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural designers in accord with the requirements of AS2159
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc
- If a geotechnical strength reduction factor, Φ_g = 0.40 is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

3.3 Permanent and Temporary Batters

The batter slope angles shown in Table 2 are recommended for the design of batters up to 8 m height and above the groundwater table; subject to the following recommendations:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures / services are located within one batter height of the crest of the batter, further advice should be sought.
5. Where steep or vertically cut rock faces are exposed, it should be inspected by a suitably experienced geotechnical engineer or engineering geologist during excavation at 1.5 m lifts to assess the need for localised rock bolting and / or shotcreting to control adverse jointing in the Bedrock unit and for overall face support.

Table 2 – Batter slope angles

Unit	Temporary	Permanent
SOIL	2H : 1V	3H : 1V
BEDROCK A, B & C	1H : 1V*	1.5H : 1V*

Note: *: See above requirements regarding inspections and local support

Steeper batters or vertical cuts (in bedrock) may be possible subject to further advice. This could include the requirement for soil nails or rock bolts. The length and spacing of soil nail and rock bolts is a matter of design.

3.4 Excavation Support

Permanent cuts in the SOIL and BEDROCK unit's steeper than the recommended permanent batter slopes in Table 2 will need to be supported by some form of retaining structure.

The design of retaining structures should be based on the following:

- Effective soil strength parameters in Table 1, and
- Water pressure (depending on the type of the structure).

With regards to the BEDROCK units, the designer shall allow a minimum lateral pressure of 10 kPa for the BEDROCK units when cut vertical. This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the unit. These loads may be able to be reduced by specifying inspections during the works and provision of additional support (rock bolts, shotcrete etc.) should the inspection indicate that support is required. In any case excavation in BEDROCK units will need to be inspected during the works to confirm/dismiss the presence of defects/structure in the unit that may result in higher loads than anticipated in this design. The designer of the wall should consider including inspection requirements in their design at no more than 2 m intervals in the excavation.

Note that design of retention systems may be based on either K_a or K_p earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_o pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_o pressures does not, of itself, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

3.5 Pavements

A total of eight (8) CBR tests (including 2 from the previous DP's investigation) were undertaken in the geotechnical investigation (Ref. PSM4010-003L Rev1). The test results indicate a soaked CBR value of between 1.0% and 11%. We note that the low CBR values were associated to samples' high swell.

We advise that a CBR of 2% can be adopted for subgrade and fill formed in bulk earthworks constructed in accordance with the Specification. Higher values, particularly in areas of significant cut, may be provided on completion of testing on the finished bulk earthworks or if, on request, the Specification is varied to obtain such higher values on fill.

We recommend that specific CBR testing be undertaken at subgrade level when pavement layouts are finalised.

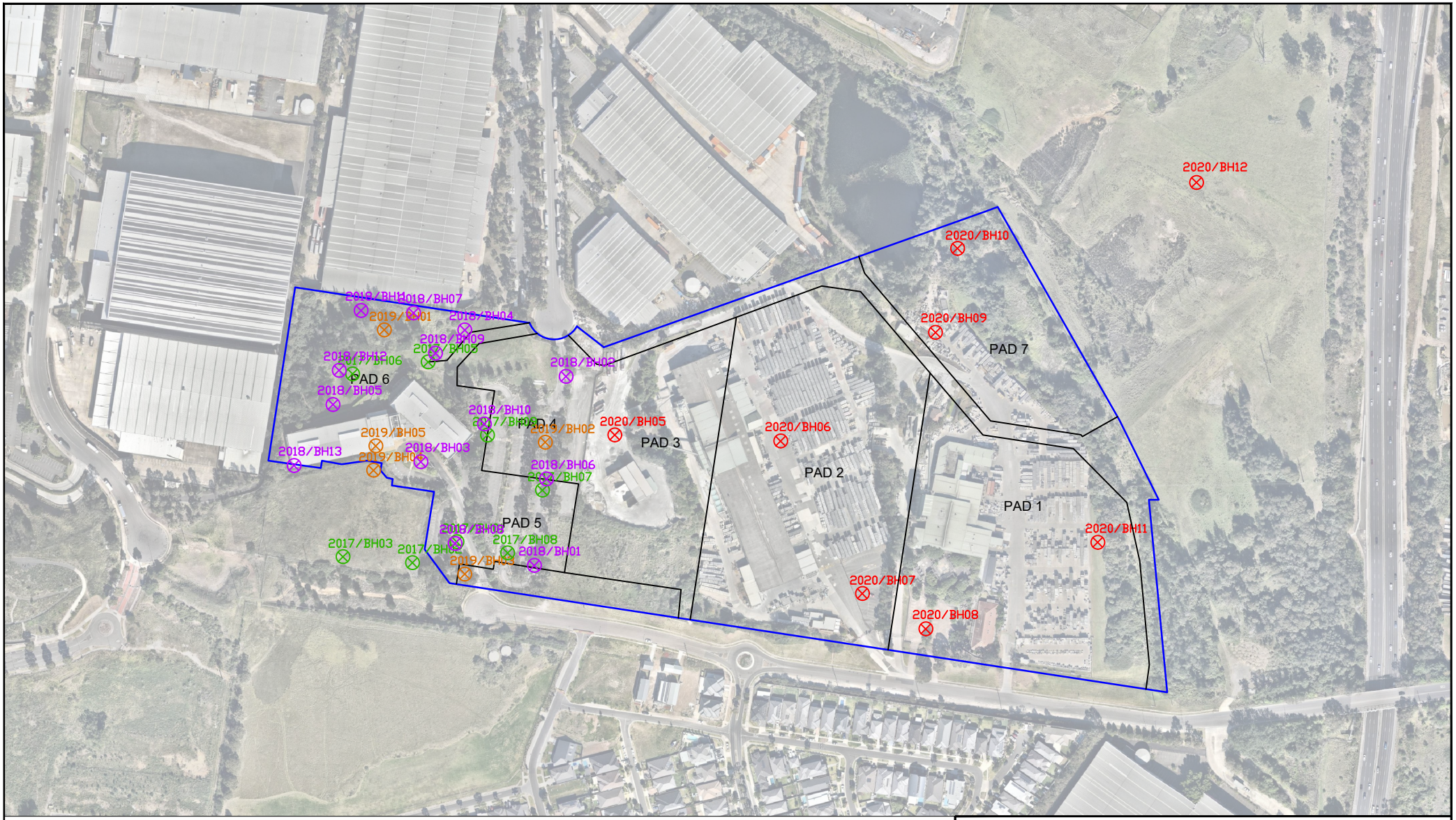
For and on behalf of
PELLS SULLIVAN MEYNINK

DANE POPE
ASSOCIATE GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
PRINCIPAL

Encl.

Figure 1 Site Locality Plan



Legend:

- 2020/BH - Boreholes undertaken in 2020
- 2019/BH - Boreholes undertaken in 2019
- 2018/BH - Boreholes undertaken in 2018
- 2017/BH - Boreholes undertaken in 2017
- Approximate boundary of proposed development
- Approximate pad boundaries

Notes:

1. Base map aerial photo retrieved from nearmap.com dated, 7/01/2020
2. Full reference provided from the letter PSM4010-003L dated XXX

Aliro Group
44 Clunies Ross Street
Prospect NSW

PROPOSED BOREHOLE LOCATIONS
LOCALITY PLAN

PSM4010	Figure 1

Appendix G
Draft Bulk Earthworks Specification – PSM4010-005S (Draft)

44 CLUNIES ROSS STREET, PROSPECT. BULK EARTHWORKS

BULK EARTHWORKS AND SPECIFICATION. FILLING, CUTTING AND TESTING

PSM4010-005S DRAFT 11 February 2020

PSM Consult Pty Limited ABN 47 134 739 496

Table of Contents

List of Figures

List of Appendices

1 Scope

This Specification details the requirements for the bulk earthworks to be undertaken at the site on 44 Clunies Ross Street, Prospect NSW. The area where this specification is applicable is shown in Figure 1. This includes area where material is filled or cut to bulk earthworks level (BEL) within the site.

Fill placed in accordance with this Specification is denoted as Engineered Fill.

This Specification does not address any environmental, contamination or erosion issues with respect to the fill material.

There is a **HOLD POINT** on placing fill in Clause 2.4 of this Specification.

2 Filling Works

2.1 Subgrade Preparation

The condition of the subgrade should be assessed immediately prior to the commencement of filling.

All Engineered Fill is to be placed on one of the following four (4) materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency or medium density.
3. Engineered compacted fill placed in accordance with this or other approved specifications for which the Geotechnical Inspection and Testing Authority (GITA) has a Level 1 certificate certifying compliance with that approved specification.
4. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM. PSM may also direct a bridging layer of Engineered Fill be placed and compacted to a Dry or Hilf Density Ratio (Standard Compaction) of between 98% and 102%. Any such layer shall be a Lot under Clause 5.3.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be moisture conditioned and compacted to be in accordance with Clauses 2.5 and 2.6 of this specification.

Engineered Fill shall be placed only on subgrade approved by the GITA as being in accordance with this specification.

2.2 Base Geometry

The slope of any buried batter shall be less than 1H:1V unless otherwise directed by PSM.

The contractor shall remove or flatten any geometrical obstructions (e.g. protrusions or holes) such that subsequent Engineered Fill can be placed to achieve the requirements of this specification.

Engineered Fill shall be placed only on areas where the base geometry has been approved by the GITA.

2.3 Material

Engineered Fill is to conform to one of the following definitions.

2.3.1 Site Won Natural Material

Site won natural soils are to conform to the definition of “Virgin excavated natural material” (**VENM**) as defined by the Protection of the Environment Operations Act 1997 No 156, Schedule 1, on Page 209:

> *“Virgin excavated natural material (eg clay, gravel, sand, soil and rock) that is not mixed with any other waste and that:*

a) *has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphide ores or soils, or*
b) *consists of excavated natural materials that meet such criteria as may be approved by the EPA".*

2.3.2 Imported Fill

Imported Engineered Fill is to conform to the definition of VENM as defined in Clause 2.3.1 and Excavated natural material" (**ENM**) as defined by the Protection of the Environment Operations (Waste) Regulation 2014 – General Exemption Under Part 6, Clause 51 and 51A, the excavated natural material exemption 2014:

"Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) *been excavated from the ground, and*
b) *contains at least 98% (by weight) natural material, and*
c) *does not meet the definition of Virgin Excavated Natural Material in the Act.*

Excavated Natural Material does not include material that has been processed or contains acid sulphate soils (ASS) or potential acid sulphate soils (PASS)."

and which meets the requirements of this exemption.

2.3.3 All Fill

The Engineered Fill shall be approved by the GITA as suitable for use in a structural fill.

Engineered Fill shall not comprise unsuitable material as defined by Clause 4.2 of AS3798-2007 "Guidelines on earthworks for commercial and residential developments" as:

a) *"organic soils, such as many topsoils, severely root-affected subsoils and peat;*
b) *materials contaminated through past site usage which may contain toxic substances or soluble compounds harmful to water supply or agriculture;*
c) *materials containing substances which can be dissolved or leached out in the presence of moisture (eg: gypsum), or which undergo volume change or loss of strength when disturbed and exposed to moisture (eg: some shales and sandstones), unless these matters are specifically addressed in the design;*
d) *silts, or materials that have the deleterious engineering properties of silt;*
e) *other materials with properties that are unsuitable for the forming of structural fill; and*
f) *fill that contains wood, metal, plastic, boulders or other deleterious material, in sufficient proportions to affect the required performance of the fill."*

The GITA shall assess that the proportion of deleterious material in each Lot is not greater than 0.25% by weight. Deleterious material is defined by Table 3015.3 of the RTA QA Specification 3051 (Edition 5 June 1998) as:

"Type III: Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood and Other Vegetable Matter"

If the GITA is not able to visually assess the above criterion, the GITA shall arrange appropriate testing.

All Engineered Fill particles shall be able to be incorporated within a single layer. Further, less than 30% of particles shall be retained on the 37.5 mm sieve.

Engineered Fill shall be able to be tested in accordance with the Standard Compaction method (AS1289.5.4.1) or Hilf test method (AS1289.5.7.1). These methods require less than 20% retained on the 37.5 mm sieve. Where between 20% and 30% of particles are retained on the 37.5 mm sieve the above test methods shall still be adopted and test reports annotated appropriately.

These requirements should be met by the material after placement and compaction.

Only material approved by the GITA shall be placed as Engineered Fill.

2.4 Fill Zonation and Placement

HOLD POINT

PROCESS HELD	PLACING OF FILL
Submission detail	The Contractor / GITA submit to PSM a Weekly certificate as defined in Clause 6.2.1 of this specification for the earthworks completed to the previous Saturday no later than 5 pm of the subsequent Wednesday.
Release of Hold Point	PSM to confirm receipt of Weekly Certificate and release Hold Point if initial assessment of the Weekly Certificate indicates it complies with requirements of this specification.

Engineered Fill shall be placed in accordance with the following requirements:

1. In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the GITA.
2. The compacted thickness of each layer shall be equal to or less than 300 mm.

Engineered Fill shall only be placed on subgrade in accordance with this specification and approved by the GITA.

2.5 Compaction

Engineered Fill shall be placed and compacted to Dry or Hilf Density Ratios (Standard Compaction) between 98% and 102%.

The insitu density shall be measured over the full depth of each layer placed.

2.6 Moisture Control

The placement moisture variation or Hilf moisture variation shall be controlled to be within 2% dry of optimum and 2% wet of optimum.

Placement moisture content of the Engineered Fill shall be measured.

3 Cutting

3.1 Subgrade Condition

The subgrade is to comprise one of the following three (3) materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency or medium density.
3. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be excavated and filled to the BEL in accordance with this specification.

4 Survey

4.1 Filling Areas

The survey requirements are as follows:

1. Any approved subgrade shall be surveyed prior to first filling such that subgrade levels are established to within ± 0.1 m. The area subject to approval shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
2. The Lot boundaries shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.

3. The location of the field density tests shall be assessed and shown on the Lot boundary plan drawing to an accuracy of at least +/-5 m in plan.
4. The elevation of the field density tests shall be surveyed to an accuracy of +/-0.05 m.

The plan drawing shall show at the boundaries of the site and other identifiable site features, to allow the location of the lots and the test to be recoverable.

4.2 Cutting Areas

Any approved subgrade for cut areas shall be surveyed such that subgrade levels are established to within ± 0.1 m.

5 Inspection and testing

5.1 Role of the GITA

The Geotechnical Inspection and Testing Authority (GITA) shall be contracted to document and certify that the works undertaken by the contractor has been completed in accordance with the relevant design and specifications.

5.2 Level 1 Control

The GITA shall adopt Level 1 responsibility as described in Section 8.2 of AS 3798-2007 "Guidelines on earthworks for commercial and residential developments":

"The primary objective of Level 1 Inspection and Testing is for the geotechnical inspection and testing authority (GITA) to be able to express an opinion on the compliance of the work. The GITA is responsible for ensuring that the inspection and testing are sufficient for this purpose."

The geotechnical inspection and testing authority needs to have competent personnel on site at all times while earthwork operations are undertaken. Such operations include:

- Completion of removal of top soil
- Placing of imported or cut material
- Compaction and adding/removal of moisture
- Trenching and backfilling
- Test rolling
- Testing.

The superintendent should agree a suitable inspection and testing plan prior to commencement of the works.

On completion of the earthworks, the GITA will usually be required to provide a report setting out the inspections, sampling and testing it has carried out, and the locations and results thereof. Unless very unusual conditions apply, the GITA should also be able to express an opinion that the works (as far as it has been able to determine) comply with the requirements of the specification and drawings."

For this particular contract, Level 1 responsibility includes:

1. Lot testing as per Clause 5.3 of this specification.
2. A frequency of compaction testing not less than that specified in Clause 5.4 of this specification.
3. The GITA documenting and reporting its activity in the terms required by Clause 6 of this specification.
4. The GITA undertaking adequate inspections and testing to comply with the above requirements and to be able to certify the fill in the terms required by Clause 6 of this specification.

5.3 Lot Testing

This specification requires lot testing to be undertaken.

A Lot is defined as a single layer of Engineered Fill consisting of uniform material which has undergone similar treatment.

Lot testing comprises the following:

1. A Lot shall be identified by the Contractor or the GITA with a Lot Number and presented for testing.
2. A Lot shall be deemed to be in accordance with the specification if all the tests undertaken within the Lot are in accordance with the specification, i.e. "a none to fail basis".
3. If any one test undertaken within a Lot fails, the whole of the Lot shall be reworked and retested.

Any portion of the placed Engineered Fill must be part of a single lot and all Lots will require approval by the GITA.

5.4 Testing Frequency (Compaction Testing)

The frequency of compaction testing for each lot shall be the greater of:

1. For lot less than 50 m^3
   a. 1 test per lot.
2. For lot between 50 m^3 and 100 m^3
   a. 2 tests per lot.
3. For lot greater than 100 m^3
   a. 1 test per 500 m^3 of material placed
   b. 3 tests per lot.

A laboratory moisture content test shall be undertaken for each field density test.

5.5 Proof Rolling and Plate Load Testing

Proof rolling, together with minor boxing out and refilling, of the upper surface of the bulk earthworks will be undertaken as directed by PSM. The plant to be adopted depends upon the design loads adopted by the structural engineers for each section of the site.

Plate load testing shall be undertaken at the direction of PSM at final bulk earthworks level (BEL) prior to the placement of roadbase or capping material. Expected test frequency is approximately a day of testing for each building pad.

The contractor is to make a suitable reaction (eg 20 tonne excavator) available for the tests.

5.6 Inspection, Testing and Survey

The GITA shall at least undertake the following tasks:

Cut areas

1. Identify the subgrade as one of the three (3) subgrade types listed in Clause 3.1 of this specification and assess that the subgrade condition of cut areas is in accordance with the subgrade condition requirements of Clause 3.1 of this specification.
2. Should Engineered Fill be required to fill overcut areas, assess that filling has been placed in accordance with this specification.

Fill areas

1. Identify the subgrade as one of the four (4) subgrade types listed in Clause 2.1 of this specification and assess that the subgrade condition of any area prior to placement of fill material is in accordance with the subgrade preparation requirements of Clause 2.1 of this specification. The GITA needs to include / refer to PSM approval in its weekly report for subgrade comprising existing fill and other materials as approved by PSM

2. Assess that the base geometry of any area prior to placement of fill material is in accordance with the base geometry requirements of Clause 2.2 of this specification.
3. Assess that the material placed is in accordance with the fill material requirements of Clause 2.3 of this specification.
4. Assess that the Engineered Fill has been placed in accordance with the requirements for fill zonation and placement of Clause 2.4 of this specification.
5. Assess that each Lot as presented for approval by the contractor is in accordance with the requirements for Lot definition of Clause 5.3 of this specification.
6. Ensure that the survey requirements in Clause 4 of this specification have been completed.
7. Estimate the approximate volume of Engineered Fill placed in each Lot presented for approval.
8. Conduct Lot testing in accordance with the construction control testing requirements of Clauses 5.3 and 5.4 of this specification.
9. Assess that the compaction of each Lot is in accordance with the requirements of Clause 2.5 of this specification. The GITA shall select a depth of insitu density tests that allows the density of the full layer to be assessed.
10. Assess that the moisture variation of each Lot is in accordance with the requirements for moisture control in Clause 2.6 of this specification.
11. Conduct material property testing in accordance with the material testing requirements in this specification.

6 Reporting and certification

6.1 Reporting

The GITA shall produce at least the following reports:

1. *Subgrade Approval Reports* (a sample is attached). Such a report shall:

- Document assessments undertaken for tasks 1 and task 3 of Clause 5.6 including reporting the subgrade type
- Document the subgrade survey that has been undertaken
- Approve or reject the subgrade condition and base geometry for filling, based on tasks 3 and 4 of Clause 5.6
- Approve or reject the subgrade condition for cut areas based on task 1.

2. *Lot Approval Reports* (a sample is attached). Such a report shall:

- Document assessments, testing and survey undertaken for tasks 3 to 11 of Clause 5.6
- Report the results of testing undertaken for task 8 of Clause 5.6
- Approve or reject lots based on tasks 9 and 10 of Clause 5.6.

3. Material Testing Reports. Such a report shall:

- Report the results of material property testing undertaken for task 11 of Clause 5.6

4. *Daily Reports* (a sample is attached). Such a report shall be completed daily and shall:

- Document time spent on site by the GITA personnel
- List subgrade assessments and approvals undertaken each day with reference to relevant Subgrade Approval Report(s)
- List Lots presented, accepted and approved or rejected each day, with reference to relevant Lot Approval Report(s)
- List survey undertaken each day as for task 8 of Clause 5.6 and not already documented in the Subgrade or Lot Approval Reports
- Document other relevant activities undertaken on site that day (site instructions, breakdowns, compaction equipment used, etc.).

6.2 Certification

6.2.1 Weekly Certificates

The GITA shall produce a Weekly Certificate for any week in which earthworks are undertaken in accordance with this Specification. The Weekly Certificate will cover all works from the previous Weekly Certificate until the end of work on a Saturday.

The Weekly Certificate shall transmit the following:

- Copy or reference to the complete specification document(s)
- Subgrade Approval Reports
- Lot Approval Reports
- Material property testing reports
- Daily Reports
- Survey of subgrade geometry prior to filling or in cut areas
- Plan survey drawing showing lot boundaries and location of density tests
- Survey documenting filling undertaken to date and showing location of testing
- Provide an Excel spreadsheet presenting the results of the week's acceptance testing completed by the GITA.

And certify that:

"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4010-005S dated xxx).'

6.2.2 Interim and Final Filling Certificate

At the completion of the bulk earthworks, or as requested by the Client, the GITA shall provide an interim or Final Filling Certificate which shall:

1. Transmit a reference list of the Weekly Certificates.
2. Provide an Excel Spreadsheet presenting the results of all the acceptance testing completed by the GITA
3. Certify that "All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4010-005S dated xxx")."

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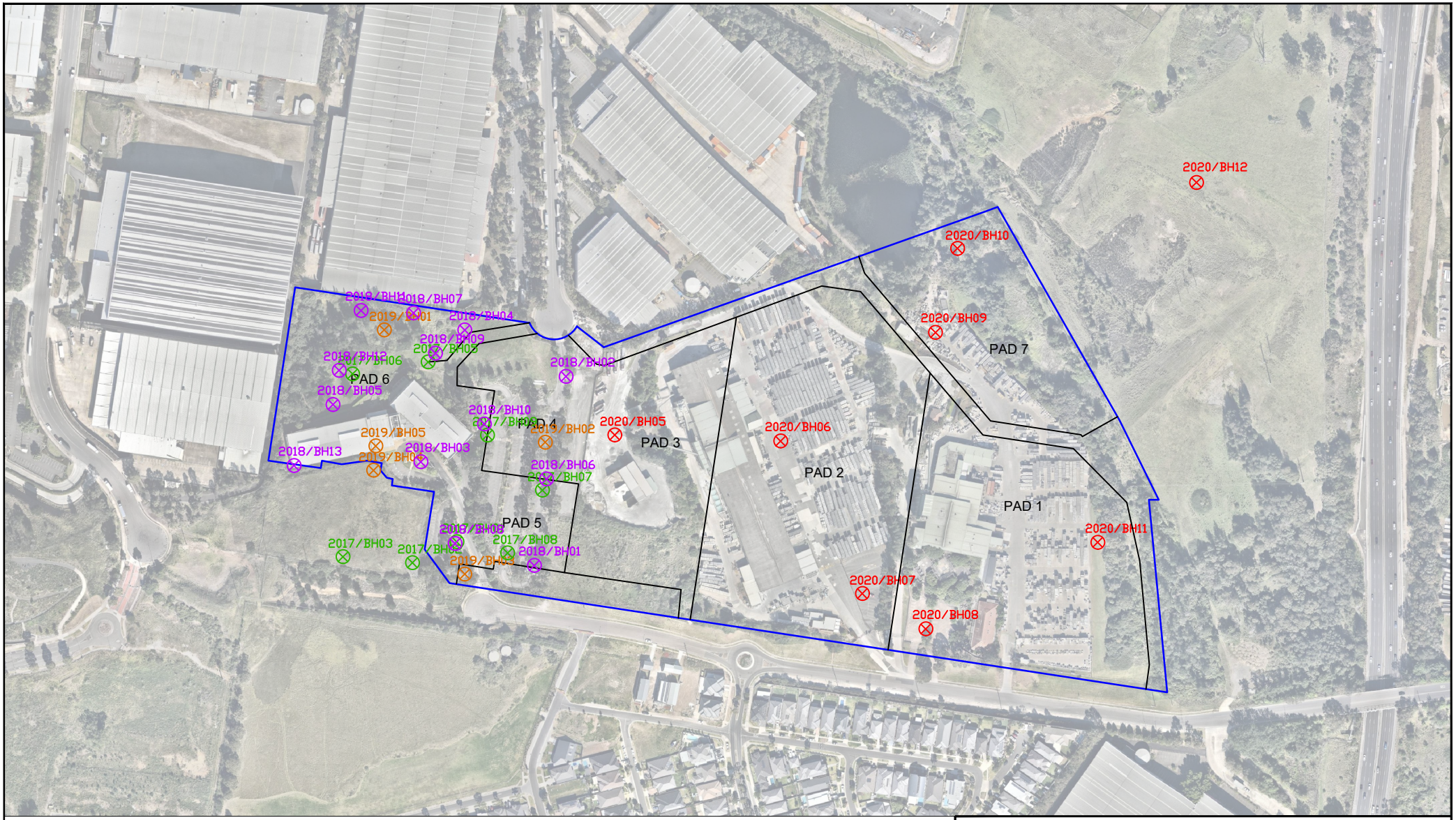

Legend:

- 2020/BH - Boreholes undertaken in 2020
- 2019/BH - Boreholes undertaken in 2019
- 2018/BH - Boreholes undertaken in 2018
- 2017/BH - Boreholes undertaken in 2017
- Approximate boundary of proposed development
- Approximate pad boundaries

Notes:

1. Base map aerial photo retrieved from nearmap.com dated, 7/01/2020
2. Full reference provided from the letter PSM4010-003L dated XXX

Aliro Group
44 Clunies Ross Street
Prospect NSW

PROPOSED BOREHOLE LOCATIONS
LOCALITY PLAN

PSM4010	Figure 1

Appendix A
Subgrade Approval Report (Sample Only)

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

SUBGRADE APPROVAL REPORT

Client:	Contractor:
Job number:	Report number:
Project:	Technician:

Subgrade areas assessed:

Area ID	Date	Approximate extent	Subgrade description	Geometry summary	Specification reference	Compliance (Pass/Fail)	Survey reference	Approved (Yes/No)

COMMENTS:

Signed: Date:

Appendix B
Lot Approval Report (Sample Only)

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

LOT APPROVAL REPORT

Client:	Report number:
Job number:	Report date:
Project:	Technician:
Contractor:	Test methods:

LOT ID:	**Sheet of**
Retest (Yes/No)	Original test report number:
Specification reference	
Location:	
Lot boundary survey reference/location:	
Materials description:	*(MATERIAL TYPE, colour, minor components, maximum particle size)*
Material identification:	*(Identify the material as defined in Clause 2.3.1, Clause 2.3.2 or Clause 2.3.3 of the Specification)*
Deleterious material assessment:	*(Report proportion of deleterious material)*
Layer thickness:	
Accepted as Lot: (Yes/No)	Date:
Approximate volume (m3)	Number of tests required:

Test ID No.				
Test soil description				
Date tested:				
Grid reference				
Surveyed test locations (RL,E,N)				
Test depth (mm)				
Max size (mm)				
% Oversize material (wet)				
Field wet density (t/m^3)				
Field moisture content (%)				
PWCD (t/m^3)				
Compactive effort				
Moisture variation (%)				
HILF density ratio (%)				
TEST (Pass/Fail)				

LOT APPROVAL	(Pass/Fail)	Signed:	Date:

Appendix C
Daily Report (Sample Only)

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

DAILY REPORT

Client:	Report number:
Job number:	Report date:
Project:	
Location:	Level of testing: Level 1
Contractor	Technician:
Time on site:	
Time off site:	

1. Subgrade Approval

Areas ID	Subgrade Approval Report No:	Comments

2. Lot Approval

Lot ID	Lot Approval Report No:	Comments

3. Survey

Type of survey	Survey undertaken by:	Reference

4. Instructions received on site

5. Instructions given on site

COMMENTS:

Signed: Date:

Appendix D
Certification Letter (Sample Only)

Our Ref:

Date:

Addressed to: Earthwork Contractor

Attention: Earthwork Contractor Representative

Dear

RE: SAMPLE INTERIM (OR FINAL) FILLING CERTIFICATE
INDUSTRIAL DEVELOPMENT, BULK EARTHWORKS
CERTIFICATION OF EARTHWORKS
BETWEEN [DATE OF COMMENCEMENT] AND [DATE OF COMPLETION]

In the period between [date start] and [date finish] the contractor has undertaken earthworks in areas XXX and XXX.

During the above period:

- The GITA has prepared the following Subgrade Approval Reports:

1. Subgrade Approval Report No 1
2. ……

- The GITA has prepared the following Lot Approval Reports:

1. Lot Approval Report No 1
2. ……

- The GITA has prepared the following Daily Reports:

1. Daily Report No 1……
2. ……

- The following subgrade survey was undertaken:

1. Subgrade Survey reference……
2. ……

- The following weekly survey was undertaken:

1. Weekly survey of week ending …….reference……..
2. ……

Copies of all the above documents are attached.

The GITA certifies that all the earthworks undertaken in the above stated period are documented in the above reports and have been undertaken in accordance with the Specifications (ref. PSMnnnn-nnnS, dated XXX) a copy of which is attached, with the exception of:

1. List outstanding issues (not approved subgrade, lots, unsuitable material, failed tests etc.)
2. ……..

Signed

GITA